NIOSH Personal Protective Technology Program Evidence Package
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NIOSH PPT Program Evidence Package Aug 30, 2007

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List of Acronyms

Appendix A lists the acronyms used in the PPT Program's Evidence Package with their meanings.

Commonly Used Acronyms
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A

AAEM	American Academy of Emergency Medicine
AAOHN	American Association of Occupational Health Nurses
AAR	Applicant Assigned Reference Number
ABMS	Automated Breathing and Metabolic Simulator
ACGIH	American Conference of Governmental Industrial Hygienists
ACOEM	American College of Occupational and Environmental Medicine
AEL	Authorized Equipment List
AF	applied force
AFGE	American Federation of Government Employees
AHA	American Hospital Association
AIDS	acquired immunodeficiency syndrome
AIHA	American Industrial Hygiene Association
AIHce	American Industrial Hygiene Conference and Exposition
ALOSH	Appalachian Laboratory for Occupational Safety and Health
AMA	American Medical Association
ANPR	advance notice of proposed rule making
ANSI	American National Standards Institute
AORN	Association of periOperative Registered Nurses
AOHN	Association of Health Nurses
AOHC	American Occupational Health Conference
AP	Air-Purifying
APD	air-purifying device
APER	air-purifying escape respirator
APERS	air-purifying escape respirator system
APEX	Achieving Performance Excellence
APF	assigned protection factor
APHA	American Public Health Association
APIC	Association for Professionals in Infection Control and Epidemiology
APR	air-purifying respirator
ARTBA	American Road and Transportation Builders Association
ASR	air-supplied respirator
ASRS	air-supplied respirator section
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials International
ATS	American Thoracic Society
ATSDR	Agency for Toxic Substances and Disease Registry

B

BCOA	Bituminous Coal Operators of America
BF	biodynamic force
BLS	U.S. Bureau of Labor Statistics
BMS	Breathing and Metabolic Simulator
BOSH	Bureau of Occupational Safety and Health
BRDPI	Biomedical Research and Development Price Index
BSC	Board of Scientific Counselors
BSI	British Standards Institution

C

CAESAR	Civilian American and European Surface Anthropometry Resource
CAP	concentrated ambient particles
CAS	Chemical Abstracts Service

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CASSI	Chemical Abstracts Service Source Index
CBRN	chemical, biological, radiological, and nuclear
cc	cubic centimeter
CCBA	closed-circuit breathing apparatus
CC-SCBA	closed-circuit self-contained breathing apparatus
CCDPHP	Center for Chronic Disease Prevention and Health Promotion
CCEHRP	Committee to Coordinate Environmental Health and Related Programs
CCOHS	Canadian Center for Occupational Health and Safety
CD	criteria document (NIOSH)
CDC	Center for Disease Control and Prevention
CDC/IS	CDC Information System
CDRH	Center for Devices and Radiological Health (See FDA)
CD-ROM	compact disk – read-only memory
CEL	Certified Equipment List
CEM	Center for Emergency Medicine
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CET	Certification, Evaluation, and Testing Team (NPPTL)
CFOI	Census of fatal occupational injuries
CFR	Code of Federal Regulations
CFR	Center for Filtration Research
CGA	Compressed Gas Association
CIB	Current Intelligence Bulletin (NIOSH)
CIH	Certified Industrial Hygienist
CIIT	Chemical Industry Institute of Toxicology
CIO	centers, institutes, or offices (within CDC)
CISD	critical incident stress debriefing
CMA	Chemical Manufacturers Association
CMF	Customer and Market Focus
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CON	contract report (NIOSH)
COOP	continuity of operations
COPD	chronic obstructive pulmonary disease
COPPE	Committee on Personal Protective Equipment
CPC	chemical protective clothing
CPIP	Certified Product Investigation Process
CPSC	Consumer Product Safety Commission
CPWR	Center to Protect Workers' Rights
CRADA	Cooperative Research and Development Agreement
CSTE	Council for State and Territorial Epidemiologists
CT	Control Technology Report (NIOSH)
CWA	Chemical warfare agent

D

DART	Division of Applied Research and Technology
dB	decibel
DBBS	Division of Biomedical and Behavioral Science (NIOSH)
DBI-SALA	DBI-SALA Fall Protection, Inc
DIEMS	Data Information Exchange Management System (NIOSH)
DHEW	Department of Health, Education and Welfare
DHHS	Department of Health and Human Services
DHS	Department of Homeland Security

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DMAT	Disaster Medical Assistance Team
DMS	document management system (NIOSH)
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOJ	Department of Justice
DOL	Department of Labor
DOP	dioctyl phthalate
DOT	Department of Transportation
DOT-ERG	U.S. Department of Transportation Emergency Response Guide
DRDS	Division of Respiratory Disease Studies (NIOSH)
DSHEFS	Division of Surveillance, Hazard Evaluations and Field Studies (NIOSH)
DSR	Division of Safety Research (NIOSH)
DVBID	Division of Vector Borne Infectious Disease

E

EBA	Escape Breathing Apparatus
ECBC	U.S. Army Edgewood Chemical Biological Center
eCLOSH	Electronic Library of Construction Safety and Health
eDMS	electronic document management system
EID	Education and Information Division (NIOSH)
EIS	Epidemic Intelligence Service
EMS	emergency medical services
EMT	Executive Management Team
EMT	Emergency Management Team or Technician
EMT	Emergency Medical Technician
EN	European
EPA	Environmental Protection Agency
ERC	Emergency Response Coordinator
ERC	Education Resources Center
ERCG	emergency response coordination groups
ERO	emergency response officer
ERP	emergency response plan
ERT	emergency response team
ESLI	end-of-service-life indicator (NIOSH)
EST	emergency support team

F

FACE	fatality assessment and control evaluation (NIOSH)
FBI	Federal Bureau of Investigation
FC	Framework Committee
FCC	Federal Coordinating Committee (of IAB)
FDA	U.S. Food and Drug Administration
FDA CRDH	U.S. Food and Drug Administration Center for Devices and Radiological Health
FDIC	Fire Department Instructor's Conference
FEMA	Federal Emergency Management Agency
FFFIPP	Fire Fighter Fatality Investigation and Prevention Program
FFR	filtering facepiece respirator
FOI	freedom of information
FOIA	Freedom of Information Act of 1966 (Amended 1986)
FOP	Fraternal Order of Police
FRN	Federal Register Notice

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FSR	filter self-rescuer
FTE	full-time equivalent
FVC	forced vital capacity
FY	fiscal year

G

GB	Sarin
GC	gas chromatograph
GPO	Government Printing Office
GPRA	Government Performance and Results Act (1993)
GPS	global positioning system
GS	general schedule
GSA	General Services Administration

H

H5N1	avian influenza / bird flu / Influenza A virus subtype
HAVS	Hand-arm vibration syndrome
HAZMAT	hazardous material
HAZWOPER	hazardous waste operation and emergency response
HC	hazard control
HCRB	Health Communications Research Branch (NIOSH)
HD	sulfur mustard
HELD	Health Effects Laboratory Division/NIOSH
HEPA	high-efficiency particulate air (filters)
HEROES	Homeland emergency response operational and equipment systems
HETA	Hazard Evaluation and Technical Assistance Report/NIOSH
HHE	health hazard evaluation/NIOSH
HHS	Health and Human Services
HID	hazard ID
HIV	Human immunodeficiency virus
HLI	Howard Leight Industries - Bilsom
HLR	Hearing Loss Research
HPD	Hearing Protection Devices
HRMO	Human Resources Management Office
HSDB	hazardous substances data bank
HSG	health and safety guide
HSRB	Human Subjects Review Board
HTV	hand-transmitted vibration
HVAC	heating, ventilating, and air-conditioning
HVS	hand vibration syndrome
Hz	hertz

I

IA	interagency agreement
IAB	Interagency Board for Equipment Standardization and Interoperability
IACP	International Association of Chiefs of Police
IAEM	International Association of Emergency Managers
IAFC	International Association of Fire Chiefs
IAFF	International Association of Firefighters
IAQ	indoor air quality
IARC	International Agency for Research on Cancer
IC	information circular

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ICG	International Coal Group, Inc
ICRP	International Commission on Radiological Protection
ICWU	International Chemical Workers Union
IDLH	immediately dangerous to life or health
IEEE	Institute of Electrical and Electronics Engineers
IEMP	Integrated Emergency Management Plan
IEQ	indoor environmental quality
IH	industrial hygienist
IMS	Incident Management System
IOM	Institute of Medicine
IR	infrared
IRB	Investigational Review Board
IRIS	Integrated Resources Information System
ISEA	International Safety Equipment Association
ISFP	International Society for Fall Protection
ISO	International Organization for Standardization
ISRP	International Society for Respiratory Protection

J

K

KO_2	Potassium Superoxide

L

LANL	Los Alamos National Laboratory
LC_{50}	lethal concentration 50 per kill
LCLo	lowest published lethal concentration
LD_{50}	lethal dose 50 percent kill
LDLo	lowest published lethal dose
L/min	liter(s) per minute
Lpm	liters per minute
LRPL	laboratory respirator protection level
LTFE	long-term field evaluation (NPPTL)

M

m	Micron, micrometer
MAD	Mean aerodynamic diameter
MASO	Management Analysis and Services Offices
MESA	Mining Enforcement and Safety Administration *(now MSHA)
mg	Milligram
mg/m^3	Milligrams per cubic meter
MHz	megahertz
MILSPEC	U.S. military specified
MIPT	Memorial Institute for the Prevention of Terrorism
MIST	Man-in-Simulant Test
ml	Milliliter
MMAD	Mass median aerodynamic diameter
mmHg	Millimeter of mercury
MMWR	Morbidity and Mortality Weekly Report (CDC)
MOU	memorandum of understanding
MSA	Mine Safety Appliances company
MSD	musculoskeletal disorders

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MSDS	material safety data sheets
MSHA	Mine Safety and Health Administration (DOL)
mTb	multidrug-resistant tuberculosis

N

NA	the National Academies
NACOSH	National Advisory Committee on Occupational Safety and Health
NAS	National Academy of Sciences
NCEH	National Center for Environmental Health (CDC)
NCHS	National Center for Health Statistics (CDC)
NCID	National Center for Infectious Diseases
NDA	National Demolition Association
NEISS	National Electronic Injury Surveillance System
NFPA	National Fire Protection Association
NFSIMC	National Fire Service Incident Management Consortium
NHCA	National Hearing Conservation Association
NIMS	National Incident Management System
NIH	National Institutes of Health
NIHL	Noise Induced Hearing Loss
NIIMS	National Interagency Incident Management System
NIJ	National Institute of Justice
NIOSH	National Institute for Occupational Safety and Health
NIOSH OD	Office of the Director, NIOSH
NIST	National Institute of Standards and Technology
nm	nanometer
NMA	National Mining Association
NNI	National Nanotechnology Initiative
NNIN	National Nanotechnology Infrastructure Network
NORA	National Occupational Research Agenda
NPPTL	National Personal Protective Technology Laboratory
NRC	National Research Council
NRCA	National Roofing Contractor's Association
NRR	noise reduction rating
NRT	National Response Team
NSC	National Safety Council
NSF	National Science Foundation
NSTI	Nano Science Technology Institute
NTOF	National Traumatic Occupational Fatalities
NTP	National Toxicology Program
NTRC	NIOSH Nanotechnology Research Center
NTTC	National Technology Transfer Center
NVFC	National Volunteer Fire Council

O

OCBA	open-circuit breathing apparatus
OC-SCBA	open-circuit, self-contained breathing apparatus
OD	Office of the Director
OEA	Organizational Excellence Assessment
OEL	occupational exposure limit (NIOSH)
OEP	Office of Extramural Programs
OEPR	Office of Emergency Planning and Response
OHAP	The Occupational Health Assurance Program
OHC	Office of Health Communications

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OLES	Office of Law Enforcement Standards
OMB	Office of Management and Budget Circular A-76 (Federal policy for public private competition)
OPM	U.S. Office of Personnel Management
OSHA	Occupational Safety and Health Administration (DOL)
OSTP	Office of Science and Technology Policy

P

PAH	polycyclic aromatic hydrocarbons
PAPR	powered air-purifying respirator
PART	program assessment rating tool (program improvement)
PASS	personal alert safety system
PBZ	personal breathing zone
PCMIA	Pennsylvania Coal Mining Institute of America
PD	Police Department
PDA	personal data assistant
PDF	portable document format
PEL	permissible exposure limit (OSHA)
PHS	Public Health Service
PLHCP	Physician or other licensed health care professional
PM	Project Memorandum
PMA	President's Management Agenda
PNNL	Pacific Northwest National Laboratory
ppb	parts per billion
PPC	personal protective clothing
PPD	personal protective devices
PPE	personal protective equipment
ppm	parts per million
PPT	personal protective technology
PQP	Product Quality Plan
PRL	Pittsburgh Research Laboratory
PSD	Policy & Standards Development branch
psi(a)	pound per square inch (absolute)
PwSCSR	Person-wearable Self-contained Self-rescuer

Q

QA	quality assurance
QC	quality control
QLFT	qualitative fit test
QNFT	quantitative fit test

R

r2p	Research- to-Practice
R&D	research and development
RD_{50}	concentration eliciting a 50% decrease in respiratory rate
RDECOM	Research, Development and Engineering Command
RDL	Respirator Decision Logic
REAT	Real-Ear Attenuation at Threshold
REL	recommended exposure limit (NIOSH)
RF	radiofrequency
RH	relative humidity
RI	Report of Investigation

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RKB	Responder Knowledge Base
RPD	respirator protective device
RRF	risk reduction factor
RSD	relative standard deviation
RSL	respirator selection logic

S

SAF	Standard Application Form
SAP	Standard Application Procedure
SAR	supplied-air respirator
SARS	Severe Acute Respiratory Syndrome
SBCCOM	U.S. Army Soldier and Biological Chemical Command
SBS	sick building syndrome
SCBA	self-contained breathing apparatus
SCP	standard conditioning procedure
SCSR	self-contained self-rescuer
SDO	Standards Development Organizations
SEI	Software Engineering Institute – Carnegie Mellon University
SEI	Safety Equipment Institute
SEL	Standardized Equipment List
SIC	Standard Industrial Classification
SME	Subject matter expert
SME	Society for Mining Metallurgy and Exploration
SOP	standard operating procedures
SPL	Sound Pressure Level
SRL	Spokane Research Laboratory
SSPC	Society for Protective Coatings
SSPR	steady-state permeation rate
SSVR	Surround-screen virtual reality
STEL	short-term exposure limit
STF	Slips, Trips, and Falls
STM	Standard Test Method
STP	standard test procedure
SWPF	simulated workplace protection factor

T

TB	tuberculosis
TC number	Testing and Certification number; the NIOSH approval number designation
TCLo	lowest published toxic concentration
TEAT	total effective acceleration transmissibility
TEB	Technology Evaluation Branch (NPPTL)
TI	Traumatic Injury
TIC	toxic industrial chemicals
TIM	toxic industrial materials
TLV	threshold limit value (ACGIH)
TLV-C	threshold limit value – ceiling (ACGIH)
TLV-Skin	threshold limit value - skin adsorption (ACGIH)
TN	Task number; a unique number assigned by NIOSH to each application
TRA	Test Representative Agent
TRB	Technology Research Branch (NPPTL)
TSWG	Technical Support Working Group
TWA	time-weighted average
TWG	Technical Working Group

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U

UAW	United Auto Workers
USBM	United States Bureau of Mines
USFA	United States Fire Administration
USTAG	United States Technical Advisory Group
USC	United States Code
UV	ultraviolet
UMWA	United Mine Workers of America
USWA	United Steel Workers of America

V

VA	U.S. Department of Veterans Affairs
VR	Virtual reality
VWF	vibration-induced white finger
VX	nerve agent (VX is a nerve agent)

W

WEEL	workplace environmental exposure limit
WMD	weapons of mass destruction
WPF	Workplace Protection Factor

Y

YTD	year to date

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History of the PPT Program

Appendix B provides a tabulated history of the development of the NIOSH Personal Protective Technology Program. Highlights of PPT Program History include establishment of the National Personal Protective Technology Laboratory in Pittsburgh, PA. This occurred in FY 2001, when Congress allocated funds to establish a new program for personal protective technology and respirator research.

Highlights and Events Affecting the PPT Program Pre - 1977

YEAR	HIGHLIGHTS AND EVENTS
1907	Mine explosion and fire at Monongah, West Virginia which claimed 362 miners and prompted events that led to the creation of the U.S. Bureau of Mines (USBM)
1910	Creation of the USBM. The need for PPE for underground miners was recognized when the Bureau of Public Health and Marine Hospital Service assisted the USBM in an investigation of an Alabama mine explosion.
1916	A mine explosion in Bruceville, Indiana resulted in the first use of the Proto Apparatus by a mine rescue crew. In addition, upon the entry of the United States into World War I, the U.S. Army assigned the USBM responsibility for military research and production of respirators that resulted in an assortment of gas masks.
1917	In support of the war effort, the USPHS developed tests on methods of disinfecting clothing at a plant in Philadelphia, Pennsylvania. [1]
1918	Dr. Alice Hamilton (the first American physician to devote her life to the practice of industrial medicine) reported the first study on vibration-induced injuries and disorders in the United States.
1920	The Gibbs apparatus became the first respirator to be approved by the USBM.
1926	The USBM created a health and safety branch, and Surgeon R.R. Sayers from the USPHS with a history of assignment to the mine rescue cars was designated chief surgeon in charge of that branch. The branch included the responsibility for the development of respirators for use in industry as protection against various vapors and dusts and the approval of gas masks.
1931	The USPHS established an Office of Dermatoses Investigations. During World War II, this office helped the Army and Navy to design protective clothing for workers in hazardous trades. The USPHS assisted the War and Navy Departments in inspecting war industry factories as well as conducting related research that resulted in more than 100 confidential reports that included physiologic evaluation of oxygen breathing devices and combat clothing.
1961	A survey of health hazards by the USPHS regarding construction included suggestions for frequent washing of hands and body and changing of clothing and PPE including respirators, gloves, clothing, and eye guards.
1969	The 1969 Federal Coal Mine Health and Safety Act (Public Law 91-173) led to the creation of an advisory committee that was responsible for consulting with and making recommendation to the Secretary of the Interior on coal mining research.
1970	The Occupational Safety and Health Act of 1970 established NIOSH within DHEW (now DHHS). The act defined NIOSH role and responsibilities to conduct research, demonstrations and experiments for public health and occupational safety and health issues.[2]
1971	Occupational Safety and Health Administration (OSHA) created its basic personal protective equipment standard for general industry (29 CFR 1910.132). NIOSH describes crucial need to establish correct role of respiratory protection in the workplace.[3] First National Fire Protection Association (NFPA) consensus standard established for structural firefighting.
1972	First Particulate Respirator Approval via Schedule 21C (176 active approvals as of May 2007) NIOSH begins respiratory protection research activities and respirator certification. 30 CFR Part 11 was published and NIOSH began to co-certify respirators with the USBM.[4]
1973	First Self Contained Breathing Apparatus (SCBA) respirator approval (444 active approvals as of May 2007). First Supplied Air Respirator (SAR) approval (298 active approvals as of May 2007). First Chemical Cartridge Respirator Approval (1874 approvals as of May 2007).[5]
1974	First Gas Mask respirator approval (162 active approvals as of May 2007). Research was underway for improved test methods and equipment for approval testing of dust, fume, and mist respirators. Aspects of this research included more efficient face piece fitting, more efficient filtration of aerosols, lower breathing resistance, and a test panel of male and female human subjects having anthropometric specifications representing 95 percent of the U.S. working population.[6]
1975	NIOSH sponsored and organized the 2nd International Conference on Hand-Arm Vibration in Cincinnati, OH, which marked the beginning of a series of NIOSH's investigations on hand-arm vibration syndrome.
1976	First NFPA consensus standard for proximity firefighting (NFPA 1976). Self-contained self-rescuers, developed under interagency agreement with the USBM and proposed by MESA as replacements for current self rescuers, were tested by NIOSH in 1976.

Highlights and Events Affecting the PPT Program 1977 - 1996

YEAR	HIGHLIGHTS AND EVENTS
1977	The Federal Mine Safety & Health Act of 1977 prescribed concentrations of respirable dust to be determined by the use of personal dust samplers and identified the use of respirators approved by the Secretaries of Labor and HHS for protection against respirable dusts. This act transitioned MESA advisory role under the 1969 Coal Act in DOI to more of an enforcement authority as MSHA under DOL. The Division of Safety Research (DSR) was established as part of NIOSH in Morgantown. This marked the first division-level focus on PPT research in NIOSH.[7] NIOSH Respirator Certification Program transferred to DSR. First NFPA consensus standard for wild land firefighting.
1979	DSR published a list of certified equipment as of July 1, 1978. [7, 8]
1981	The PPT program decided to focus its PPE research upon respirators and related technologies alone, and drop the testing of other PPE such as industrial and fire fighter helmets; safety glasses, goggles and face shields; gloves; industrial footwear; etc. Fiscal year 1981 was the last year a project addressing these devices was part of the NIOSH plan. [7, 8] MSHA/NIOSH approved 1 hr Self-Contained Self-Rescuers (SCSRs) that were deployed in underground coal mines in the United States..
1984	NIOSH engaged in PPE regarding hazardous waste sites in 1984. A mobile laboratory was renovated for Superfund activities and field studies. Chemical protective clothing for waste dump cleanup, projects were launched to validate two methods of testing for chemical resistance. Three field test methods were adapted from American Society for Testing Materials methods for chemical degradation, chemical penetration, and chemical permeation. Tests adopted for CPC from ASTM.
1987	PPT leadership began developing an internal implementation strategy for the “Proposed National Strategy” for severe occupational traumatic injury. An analysis of the proposed national occupational injury strategy and realignment of existing and creation of new occupational injury program areas were conducted. The set of program areas identified for the severe occupational traumatic injury program included: [7, 8] • Agriculture/pesticides • Certification • Chemical Protective Clothing (CPC) • Construction • Dissemination • Industrial Machine Safety • Musculoskeletal Injuries • Personal Protective Equipment • Respirator Research • Surveillance • Trauma Epidemiology This list is noteworthy for its identification of major high-risk sectors (agriculture and construction) as a focus for programmatic thinking, for the inclusion of high-risk topics such as machine safety and acute musculoskeletal injury (which have consistently been priority areas from the inception of the PPT program to the present), and a growing awareness that trauma epidemiology and dissemination of risk and prevention information represented major gaps in the existing PPT program. NIOSH proposed a comprehensive revision of certification standards under 42 CFR 84. Comments were so substantial that the PPT program decided to implement a modular approach to updating the standards.[5]
1989	NIOSH published a criteria on hand-transmitted vibration exposure.
1991	To evaluate the protection provided by a class of respirators commonly used in lead or other hazardous airborne contaminant work in 1991, NIOSH researchers measured in-facepiece respirator concentrations at two lead-acid battery manufacturing facilities.
1992	ANSI Z359 - First ANSI Fall Protection Standards introduced.[8]

YEAR	HIGHLIGHTS AND EVENTS
1993	When NIOSH was just beginning to plan for a new laboratory facility in Morgantown, occupational injury developed a strategic plan for protective technology research, which largely focused upon the programs it still managed in respiratory testing, certification, and research; and chemical protective clothing (CPC). In January, the Director of the Division of Safety Research developed a plan entitled "A Protective Technology Research Program for the 1990s." This plan outlined a research plan comprising three levels of technologies and programs to include: Basic Protective Technologies, Enhanced Protective Technologies, and Advanced Protective Technologies.
1994	CDC Guidelines for the prevention of MTb in healthcare settings provided recommendation for respirators at least 95% efficient against 1 micron particle.
1995	DHHS (NIOSH) publishes 42 CFR 84 respirator approval regulations to provide more protective respirator types.[5] First Particulate Filter Respirator Approval via Schedule 84A (3893 active approvals as of May 2007). All respirator approvals were issued jointly by the MSHA and NIOSH until 1995, when the approval requirements for respiratory protection devices were transferred to Title 42, Public Health, of the Code of Federal Regulations. Under the DHHS respirator approval regulations (42 CFR part 84), NIOSH is the sole approving authority for most respirators. Specifically, the rule replaces MSHA regulations at 30 CFR part 11 with new public health regulations at 42 CFR part 84, while also upgrading testing requirements for particulate filters. Concurrently with publication by NIOSH of this new rule, MSHA published a final rule to remove existing regulations at 30 CFR part 11, which are made obsolete by this final rule. NIOSH now has exclusive authority for testing and certifying respirators with the exception of certain mine emergency devices, which continue to be jointly certified by NIOSH and MSHA.[4, 5]
1996	NIOSH unveils the first decade of National Occupational Research Agenda (NORA). USBM mine safety and health research activities were transferred to NIOSH. NIOSH Respirator certification program transferred from Division of Safety Research (DSR) to the Division of Respiratory Disease Studies (DRDS). Development of a new standard protocol for estimating the field effectiveness of hearing protection devices, Part I: Research of Working Group II, Accredited Standards Committee S12, Noise. Journal of the Acoustical Society of America, 1996. The inter-laboratory results first described by Royster et al. were the basis for several national and international regulations, standards and recommendations on evaluating hearing protection devices. Labor, Health and Human Services and Education Appropriations Senate Committee Report NIOSH is urged to process respirator certification applications within 90 days of submission to ensure workers have access to new, more protective technology.

Highlights and Events Affecting the PPT Program 1997 - 2000

YEAR	HIGHLIGHTS AND EVENTS
1997	NIOSH conducted a systematic review of Musculoskeletal Disorders and Workplace Factors and published the review report, which includes a chapter on hand-arm vibration syndrome. The Health and Safety Research Program at the USBM was permanently transferred to the NIOSH, including hearing protection research and the long term field evaluation program. NIOSH Five Year Strategic Plan developed covering 1997-2002.
1998	NIOSH Control of Workplace Hazards for the 21st Century Conference conducted with over 250 researchers, manufacturers, and stakeholders to set the research Agenda for Personal Protective Equipment (PPE) and engineering controls. The MHRAC committee's name was changed to include safety, thus resulting in the name Mine Safety and Health Research Advisory Committee (MSHRAC). A two-year charter for MSHRAC was established in 1998. MSHRAC has conducted at least seven meetings since 1998, with the last meeting occurring during May 2006. Criteria for a Recommended Standard - Occupational Noise Exposure Revised Criteria, NIOSH document 98-126, 1998. This document broke new ground in key aspects of a recommended standard, e.g. the recommendation of 85 dB(A) as the Recommended Exposure Limit (REL), along with a 3 dB exchange rate. The Criteria Document has had a strong influence on policies and practices in other governmental agencies and professional organizations, including DOD, NASA, AAA, and the Council for Accreditation in Occupational Hearing Conservation. In combination with the American Industrial Hygiene Association and the American Society of Safety Engineers, the PPT Program held a unique workshop and conference entitled, "The Control of Workplace Hazards for the 21st Century: Setting the Research Agenda" in Chicago in March 1998. It brought together more than 250 researchers, manufacturers, and users of engineering controls and personal protective equipment.
1999	NIOSH-DOD-OSHA Sponsored Chemical and Biological Respiratory Protection Workshop conducted March 10-12, 1999 provided a forum for over 140 representatives from 63 organizations to discuss issues and exchange information and learn about current respiratory protection issues associated with incidents involving chemical and biological agents. NIOSH-DOD-OSHA Sponsored Chemical and Biological Respiratory Protection Workshop DHHS (NIOSH) Publication No. 2000-122. [9] PPT Program management served as the first co-chair of the Interagency Board Standards Coordination Committee. The IAB is a user-working group supported by voluntary participation from various local, state, federal govt. and private organizations. The mission of the IAB is to establish and coordinate local, state, and federal standardization, interoperability, compatibility and responder health and safety to prepare for, train, and respond to, mitigate and recover from any incident by identifying requirements for an all-hazards incident response with a special emphasis on chemical, biological, radiological, nuclear, or explosive (CBRNE) issues.
2000	In fiscal year (FY) 2001, the U.S. Congress allocated funds to develop standards and technologies for protecting the health and safety of America's workers who rely on personal protective equipment (PPE), such as respirators, clothing, gloves, hard hats, and eye and hearing protective devices. The Centers for Disease Control and Prevention (CDC) and NIOSH established the National Personal Protective Technology Laboratory (NPPTL) in Pittsburgh, PA to provide national and world leadership for improved PPT. Creation of NPPTL in 2001 consolidated the Congressionally mandated respirator certification program, with respiratory protection research and standards development activities. The establishment of NPPTL began an initiative to align all PPT activities.

Highlights and Events Affecting the PPT Program 2001 – 2005

YEAR	HIGHLIGHTS AND EVENTS
2001	ANSI/AIHA Z88.10-2001 Respirator Fit Test Methods Consensus Standard published. September 11, 2001 terrorist attacks on WTC and Pentagon. Fall 2001 Anthrax scare. The NPPTL Leadership conducted a meeting September 13, 2001 with 16 key stakeholders to align ongoing PPT research activities with the stakeholder needs At the November 1, 2001 MSHRAC meeting, PPT Program management gave a presentation on the new NPPTL which included the strategic goals, project overviews, and an overview of the respirator certification program. A RAND Project Memorandum (PM-1228-NIOSH) titled "Development of an Institutional Planning Process for the National Personal Protective Technology Laboratory" was used as the starting point for the strategic planning effort. NPPTL conducted a series of Training Seminars for all NPPTL employees. These seminars served the dual purpose of educating/training all employees in the director's vision for the Laboratory, while simultaneously obtaining employee input on critical issues to be addressed. Three Training Seminars were arranged and conducted, one of which included the participation of Dr. John Howard, NIOSH Director. In addition to these Seminars, more than 60 face-to-face meetings were held with the Laboratory's senior planner and/or Director in order to align current PPT initiatives with stakeholder needs.
2002	NPPTL renovated buildings as a temporary solution to establishing laboratory facilities and developed standards for CBRN SCBA. FEMA Assistance to Firefighters Grant Program allocated $900 million per year for three years to protect health and safety of public firefighting personnel against fire hazards. First CBRN SCBA respirator approval (36 active approvals as of May 2007). IAB adopts NIOSH PPT Program Open Circuit CBRN SCBA Standard. At the November 7, 2002 MSHRAC meeting, the PPT Program management provided an introduction to the NPPTL and an update on the self contained self-rescuer initiative. Other topics discussed at the meeting included partnerships, selected program accomplishments, and an overview of PPT programs directly related to mining (SCSR LTFE, breathing & metabolic simulator, SCSR research & standards development, and SCSR training. NIOSH established a laboratory research program in Morgantown, West Virginia, to conduct the study of the hand-transmitted vibration exposure and health effects, which included the vibration isolation using anti-vibration gloves.
2003	Labor, Health and Human Services and Education Appropriations Senate Committee Report, provided additional funds for the NPPTL to be used, in part, to expedite research and development in, and certification of, protective equipment for use against the hazards of terrorist agents. NPPTL completed renovation of ten existing structures on Bruceton, PA facility to house laboratories and staff. Self-contained self-rescuer program transferred from PRL to NPPTL. IAB adopts NIOSH PPT Program Standard for CBRN Full-Facepiece APR. IAB adopts NIOSH PPT Program Standard for CBRN Air Purifying Escape Respirator (APER) and CBRN Self-contained escape respirator. NIOSH web-based hearing protector compendium. [http://www.cdc.gov/niosh/topics/noise/hpcomp.html]

YEAR	HIGHLIGHTS AND EVENTS
2004	Labor, Health and Human Services and Education Appropriations Senate Committee Report NPPTL was to expedite research and development in, and certification of, protective equipment, such as PAPRs, and combined SCBA/escape sets. NIOSH begins a year-long initiative to conduct public meetings across the nation to obtain stakeholder input into the second decade of NORA. First CBRN Air Purifying Respirator (APR) approval (eight active approvals as of May 2007). NIOSH researchers published a study on vibration power absorption (Vibration Energy Absorption in Human Fingers-Hand-Arm System. Medical Engineering & Physics 26(7), 2004: 483-492.). This study changed the traditional concept on vibration power absorption of the hand-arm system and leaded to the development of a new vibration exposure theory. The new concept started to affect the development of personal protecting device for reducing vibration exposure.
2005	The National Academy of Sciences conducts the first meeting with the PPT Program sponsored Committee on PPE for the Workforce (COPPE) on November 2, 2005 to be conducted three times annually as part of the PPT Program effort to maximize the quality, relevance, and impact of PPT activities The National Academy of Sciences conducts the first meeting with the PPT Program sponsored Committee to Assess the NIOSH Head-and-Face Anthropometrics Survey of U.S. Respirator Users on November 3, 2005 in an effort to validate the recommended changes to the current respirator panel. The National Academy of Sciences conducts the first meeting with the PPT Program-sponsored Committee to Review the NIOSH BLS Respirator Use Survey. The formation of a Baldrige Category team focused on the design of an effective strategic planning process began implementation in FY 2006. The key process steps include analysis of input from stakeholders, technology developers and providers, user communities and the environmental assessment.

Highlights and Events Affecting the PPT Program 2006 – Present

2006	ANSI/AIHA Z88.6-2006 Respiratory Protection - Respirator Use - Physical Qualifications for Personnel Consensus Standard published. An explosion at West Virginia SAGO mine caused the entrapment, and consequently, the deaths of 12 miners. Two mine workers died in a January 19, 2006 fire at Massey Energy's Aracoma mine. Five miners died in a May 20, 2006, explosion. British Standards Institute adopts NIOSH PPT Program CBRN SCBA Standard. NIOSH Statement of Standard for CBRN PAPR. At the May 23-24, 2006 MSHRAC Meeting, the PPT Program Manager gave a presentation on SCSR research that included SCSR history, SCSR operation, lessons learned, and the evolving revision to the LTFE program. NIOSH launched the second decade of NORA. Congressional direction: The Committee has provided $500,000 above the fiscal year 2006 level of funding for the NIOSH NPPTL to expedite research and development in, and certification of, protective equipment, such as powered air purifying respirators, and combined self-contained breathing apparatus/escape sets. The Committee encourages NIOSH to consider the value of a study to evaluate all classes of disposable NIOSH approved respirator facemasks, including but not limited to particulate and antimicrobial technology for effectiveness against transmission of avian influenza and other pathogens. The Mine Improvement and New Emergency Response Act of 2006 (Miner Act) explicitly stated the following language: • Post-accident electronic tracking to provide current or immediately pre-accident location of all underground personnel to ground personnel, consistent with technology and physical constraints, r alternative within 3 yrs • Aggregate of no less than 2 hrs per miner, SCSR caches at a distance no further than a 30 minute walk for an average miner • 2 hours of breathable air per miner required by emergency temporary standard • Maintenance schedule for reliability of self-rescuers and introduction of new technology • Training in donning, switching units and proper fit
2007	NFPA 1981 Standard on Open-Circuit Self-contained Breathing Apparatus (SCBA) for emergency services (2007 edition) requires NIOSH certification for protection against CBRN hazards as a pre-condition fro NFPA certification.

References

1. Gordon, J., *The epidemiology of injuries as a basis for public policy*. Public Health Reports, 1949. **5**: p. 411-21.

2. NIOSH, *NIOSH and "Safety" in The Advisor, Number 1 (July 1, 1972)*. 1972a, National Institute for Occupational Safety and Health: Rockville, MD. p. 6.

3. Code of Federal Regulations 29 CFR 1910.132, *Title 29 Labor, Part 1910.132 - Occupational Safety and Health Standards-Personal Protective Equipment*, in *http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9777*. 2003: U.S. Government Printing Office, Office of the Federal Register, Washington, DC.

4. Code of Federal Regulations 30 CFR 11, *Title 30, CFR, Part 11 - Respiratory protection*. 1972: U.S. Government Printing Office, Office of the Federal Register, Washington, DC.

5. Code of Federal Regulations 42 CFR 84, *Title 42: Public Health, Part 84 - Approval of Respiratory Protective Devices*. 2007, U.S. Government Printing Office, Office of the Federal Register, Washington, DC.

6. Arthur D. Little Inc., *Final Report relating to the Present Status and Requirements for Occupational Safety Research, prepared for the National Institute for Occupational Safety and Health, Health Services and Mental Health Administration, Public Health Service*, in *Contract No. HSM 099-71-30*. 1972, A.D.Little: Cambridge, MA. p. 203.

7. Stout, N. and H. Linn, *From Strategy to Reality: 25 Years of Planning and Progress in Occupational Injury Research*. Injury Prevention, 2001. **7**(Suppl I): p. i11-14.

8. Stout, N. and H. Linn, *Occupational Injury Prevention Research: Progress and Priorities.* Injury Prevention, 2002. **8**(Suppl IV): p. iv9-iv14.

9. NIOSH, *NIOSH-DOD-OSHA Sponsored Chemical and Biological Respiratory Protection Workshop, March 10-12, 1999*, in *DHHS (NIOSH) Publication No. 200-122*, *http://www.cdc.gov/niosh/2000-122.html*. 2000, National Institute for Occupational Safety and Health: Morgantown, WV.

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Description of Consensus Standards Development Organizations

Appendix C is a discussion about the ANSI oversight of the creation, promulgation and use of standards in the U.S. ANSI's role in accrediting the procedures for SDOs for developing voluntary consensus standards and as the U.S. representative in ISO. ANSI accredits the various consensus based standards and SDOs important to the PPT Program. Fields or areas of specialty are discussed along with the structure and operation of SDOs to achieve open and balanced participation for developing standards.

American National Standards Institute (ANSI)

and

Standards Development Organizations (SDOs)

As the voice of the U.S. standards and conformity assessment system, the American National Standards Institute (ANSI) empowers its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment.

ANSI oversees the creation, promulgation and use of thousands of norms and guidelines that directly impact businesses in nearly every sector: from acoustical devices to construction equipment, from dairy and livestock production to energy distribution, and many more. ANSI is also actively engaged in accrediting programs that assess conformance to standards – including globally-recognized cross-sector programs such as the ISO 9000 (quality) and ISO 14000 (environmental) management systems.

ANSI's mission is to enhance both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity.

The American National Standards Institute (ANSI) has served in its capacity as administrator and coordinator of the United States private sector voluntary standardization system for more than 90 years. Founded in 1918 by five engineering societies and three government agencies, the Institute remains a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations.

National Standardization

ANSI facilitates the development of American National Standards (ANS) by accrediting the procedures of standards developing organizations (SDOs). These groups work cooperatively to develop voluntary national consensus standards. Accreditation by ANSI signifies that the procedures used by the standards body in connection with the development of American National Standards meet the Institute's essential requirements for openness, balance, consensus and due process.

At year-end 2006, about 200 standards developers were accredited by ANSI; there were more than 10,000 American National Standards (ANS).

In order to maintain ANSI accreditation, standards developers are required to consistently adhere to a set of requirements or procedures known as the *"ANSI Essential Requirements,"* that govern the consensus development process. Due process is the key to ensuring that ANSs are developed in an environment that is equitable, accessible and responsive to the requirements of various stakeholders. The open and fair ANS process ensures that all interested and affected parties have an opportunity to participate in a standard's development. It also serves and protects the public interest since standards developers accredited by ANSI must meet the Institute's requirements for openness, balance, consensus and other due process safeguards.

American National Standards are usually referred to as "open" standards. In this sense, "open" refers to a process used by a recognized body for developing and approving a standard. ANSI's definition of openness has many elements, but basically refers to a collaborative, balanced and consensus-based

approval process. The content of the standards may relate to products, processes, services, systems or personnel.

In its role as the only accreditor of U.S. voluntary consensus standards developing organizations, ANSI helps to ensure the integrity of the standards developers that use *ANSI Essential Requirements: Due process requirements for American National Standards*. A separate process, based on the same principles, determines whether standards meet the necessary criteria to be approved as American National Standards. The process for approval of these standards (currently numbering approximately 10,000) is intended to verify that the principles of openness and due process have been followed and that a consensus of all interested stakeholder groups has been reached.

The hallmarks of this process include:

- Consensus must be reached by representatives from materially affected and interested parties
- Standards are required to undergo public reviews when any member of the public may submit comments
- Comments from the consensus body and public review commenters must be responded to in good faith
- An appeals process is required

ANSI's use of the terms "open" and "openness" to describe standards is meant to characterize documents that have undergone this kind of consensus-based, transparent process. All ANSI-accredited standards developers follow the *Essential Requirements* which embrace globally-accepted principles of standardization implemented by well-recognized, international standards bodies such as the International Telecommunication Union (ITU), International Organization for Standardization (ISO), and International Electrotechnical Commission (IEC).

The ANSI process serves all standardization efforts in the United States by providing and promoting a process that withstands scrutiny, while protecting the rights and interests of every participant. In essence, ANSI standards quicken the market acceptance of products while making clear how to improve the safety of those products for the protection of consumers.

International Standardization

ANSI promotes the use of U.S. standards internationally, advocates U.S. policy and technical positions in international and regional standards organizations, and encourages the adoption of international standards as national standards where they meet the needs of the user community.

ANSI is the sole U.S. representative and dues-paying member of the two major non-treaty international standards organizations, the International Organization for Standardization (ISO), and, via the U.S. National Committee (USNC), the International Electrotechnical Commission (IEC). As a founding member of the ISO, ANSI plays a strong leadership role in its governing body while U.S. participation, via the USNC, is equally strong in the IEC.

Through ANSI, the U.S. has immediate access to the ISO and IEC standards development processes. ANSI participates in almost the entire technical program of both the ISO and the IEC, and administers many key committees and subgroups. Part of its responsibilities as the U.S. member body to the ISO include accrediting U.S. Technical Advisory Groups (U.S. TAGs), whose primary purpose is to develop and transmit, via ANSI, U.S. positions on activities and ballots of the international Technical Committee. U.S. positions for the IEC are endorsed and closely monitored by the USNC Technical Management Committee (TMC).

In many instances, U.S. standards are taken forward to ISO and IEC, through ANSI or the USNC, where they are adopted in whole or in part as international standards. For this reason, ANSI plays an important part in creating international standards that support the worldwide sale of products, which prevent regions from using local standards to favor local industries. Volunteers from industry and government, not ANSI staff, carry out the work of the international technical committees

ISO Technical Committee 94 (TC94) deals with PPT in general. There are several sub-committees under TC94:

- SC 1 – Head Protection
- SC 3 - Foot Protection
- SC 4 – Personal Equipment for Protection against Falls
- SC 6 – Eye and Face Protection
- SC 12 - Hearing Protection
- SC 13 – Protective Clothing
- SC 14 – Fire-Fighters' personal Equipment
- SC 15 – Respiratory Protective Devices

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Strategic Goal 3: Reduce Exposure to Injury Hazards

Appendix D discusses PPT Program research activities associated with the strategic goal for reducing exposure to injury hazards. These injury related activities are located separate from Chapter 5 because they are an integral component of other NIOSH programs undergoing review by the National Academies. These Programs include Hearing Loss, Traumatic Injury, and Construction. These activities are included for completeness and to indicate the comprehensive nature of the PPT Program, but should not be reviewed.

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Appendix D. Reduce Exposure to Injury Hazards

NIOSH conducts research activities designed to address knowledge gaps and improve existing technologies to reduce exposure to injury hazards. The specific projects related to injury hazards are dispersed across the NIOSH organization. They are conducted primarily as a part of the activities of other NIOSH sector and cross-sector programs, but are directly supporting the development of advanced PPT. These activities are included for completeness and to indicate the comprehensive nature of the PPT Program, but should not be reviewed.

Hearing Loss Exposure

The core PPT Program initiatives to reduce hearing loss exposure arise from the NIOSH Hearing Loss Research (HLR) Program that has had a component related to Hearing Protection Devices (HPDs).

Although NIOSH advocates the use of PPE only in the absence of effective engineering and administrative controls, sometimes HPDs are the only practical option for control of exposures to noise hazards.

Multiple external factors affect the use of HPDs. These factors include psychosocial barriers to hearing protection device use, injury latency times, comfort issues, and compliance issues. The PPT Program strives to recognize the external factors that provide challenges to the program, and to adapt in constructive ways that lead to progress or alternative research opportunities even in the face of those challenges.

Fall Exposure

The core of the PPT Program initiatives to reduce occupational fall exposures arises from the Traumatic Injury (TI) Program fall prevention research program initiated in 1995. The current PPT-related emphases of the TI program are fall-arrest harnesses and stability- and balance-enhancing protective footwear. Although current and future fall protection and protective footwear research efforts will be conducted within the NIOSH TI Program, these activities will be addressed in both PPT and TI Program goals.

Planning, information exchange, targeted research, teamwork, and information dissemination activities will be aligned in both the PPT and the TI Programs. In this chapter, we will refer to this component of the program as the PPT/TI Program.

Vibration Isolation Gloves

The PPT Program conducts research to reduce exposure to hand-arm vibration injuries. The research is focused on developing vibration isolation devices to reduce hand-arm vibration syndrome.

As with its other goals, the PPT Program takes four tactical approaches for accomplishing this goal:

- Conduct research on personal injury protection technologies.
- Develop standards for personal injury protective equipment.
- Evaluate personal injury protective equipment.
- Conduct outreach programs for optimal use and acceptance of personal injury protective equipment by workers.

The narratives that follow describe some significant outputs and outcomes to meet each objective.

D.1 Develop Measurement and Rating Methods That are Representative of the Real-World Performance of Hearing Protection Devices. (Strategic Goal 3, Objective 2)

Issue

Using the EPA's 1981[1] estimates of noise-exposed workers and current DOL statistics of U.S. production workers, approximately 13.5 million workers in the United States wear or should wear HPDs.[2], [3] Every HPD has a Noise Reduction Rating (NRR) to guide employers and workers as to which HPDs are sufficiently protective for different workplace conditions. The current EPA regulation specifies that the ANSI S3.19-1974 is the only acceptable experimenter-fit protocol standard for hearing protection devices for determining the NRR. [4] However, results by PPT scientists have shown that NRR results using this standard overestimate the level of protection achieved in the workplace by most users, resulting in workers being overexposed to noise.[5]

Approach

The PPT Program verified the overestimates of experimenter-fit NRRs in tests of HPDs in occupational settings. They demonstrated that the measurement of attenuation for experimenter-fit protector's yield inflated NRRs. The experimenter strives to achieve the highest possible NRR and repeatable results in the lab through excellent HPD fit. However, most workers who wear HPDs lack similar motivation and training. Unlike the experimenters, they are often unaware that compromised HPD fit reduces its attenuation.

In cooperation with the EPA to revise the existing labeling regulation, the PPT Program organized and conducted research on test protocols and rating methods through partnerships with government agencies and manufacturers, and active participation with standards setting bodies. In 1988, the EPA sought technical assistance from the PPT Program with a regulatory audit for labeling of a particular HPD. This audit resulted in a re-labeling of the HPD and initiated a broad research effort to develop testing methods that were more representative of workers' use. Between 1990 and 1994, the PPT Program executed two inter-laboratory studies that included six testing laboratories from government, industry, and academia. The studies demonstrated that a subject-fit protocol reduced inter-laboratory variability compared to inter-laboratory variability using other fit methods, including the experimenter-fit protocol.[5-7] In 1997, NIOSH established an inter-agency agreement with EPA. The initial work phase was to develop testing and rating methods for passive and electronically augmented hearing protectors. Since 2002, the PPT Program has provided the EPA technical assistance with the goal of issuing a revised regulation on HPD labeling.

The PPT Program collaborates nationally and internationally to influence hearing protector testing practices, performance ratings, testing standards, and regulations worldwide. Our scientists participated in the National Hearing Conservation Association (NHCA) Taskforce on hearing protection testing 1995, [8] which first recommended the use of a subject-fit protocol following the completion of the inter-laboratory studies. Since 1990, PPT scientists have been active in ANSI S12 working groups for standards development related to hearing protector testing and rating. In 2003, 2005 and again in 2006, PPT Program staff members were appointed

as United States delegates to International Standards Organization (ISO) and International Electronics Commission (IEC) technical committee meetings for international standards development of hearing protection testing and rating.

Output and Transfer Highlights

The inter-laboratory studies resulted in four peer-reviewed publications. [5-7],[9] The first of these papers reported that the subject-fit protocol had the smallest inter-laboratory variability. The other papers compared the real-world performance with the subject-fit protocols, examined models for describing HPD attenuation data, and established statistical methods for the analysis of subject sample size to achieve adequate reliability.

In addition to these papers, PPT Program scientists wrote papers for 14 conference proceedings, presented them, and sponsored conferences and workshops on hearing protectors. The PPT Program organized and provided technical support for the EPA's 2003 workshop on hearing protector labeling regulation. This conference brought together representatives from nine HPD manufacturers (3M, Aearo, Bilsom, Bose, Gentex, HLI, Moldex Metric, North, Tasco), DOD (Army, Air Force, and Navy), and DOL, OSHA, and MSHA.

Intermediate Outcomes

Following the 2003 conference, the EPA opened a docket on revising its hearing protector labeling regulation.[10]

EPA Laboratories governed by the Safety, Health and Environmental Management Programs (SHEMP) Operations Manual for Laboratories use hearing protectors meeting the ANSI S12.6 requirements.

OSHA has required a 50% reduction of the NRR for a HPD when estimating the protected exposure level for workers since the early 1990s. The PPT Program's research on HPDs identified an inherent bias for different protector styles. The PPT Program recommends a variable reduction of the NRR that allows for the type of protector: 25% reduction for earmuffs, 50% for foam earplugs, and 70% reduction for all other types of protection.[11] MSHA went further, making no allowance for the attenuation of HPDs for mine workers.[12] OSHA identified subject-fit ANSI S12.6 Method B attenuation data as acceptable, requiring no further reduction factors.[13]

The PPT Program research provided the basis for revisions of national and international testing standards which in turn have affected international regulations for rating and certifying hearing protector performance. The American National Standards Institute rescinded ANSI S3.19 in favor of ANSI S12.6-1984.[13] The PPT inter-laboratory studies contributed significantly to the latest revision ANSI S12.6-1997 (R2002).[14] The revision removed the experimenter-fit protocol and added both an experimenter-supervised and naïve subject-fit protocol. As well, the subject sample size was increased for earplugs and semi-aural insert HPDs. For the justification of the testing protocol, sample sizes and subject-fit testing, the ANSI S12.6-1997[14]standard exclusively cites four PPT Program papers and presentations. [9],[15] As a part of the 5-year

maintenance cycle for standards, the ANSI Working Group 11 has commenced revision of the S12.6 standard to incorporate the latest research conducted on protector testing. European standards developed after the EPA regulation are based upon an experienced subject-fit protocol[16] and a less restrictive rating method[17]. The ISO technical committee 43 subcommittee 1 for noise standards wrote a test standard based upon the ANSI S12.6 subject-fit protocol.[18] In addition to the subject-fit standard, PPT scientists have contributed substantially to an ISO method to evaluate noise reduction for earmuffs on an acoustic test fixture.[19]

The ANSI S12.6-1997 standard has been the basis for revisions of several international standards for hearing protector testing and regulations. Australia and New Zealand incorporated subject-fit methods into testing, labeling, and occupational safety and health standards for hearing protectors. The Canadian Standards Association adopted the ANSI S12.6 Method B protector testing and performance classification. Brazil mandated that all hearing protectors sold in Brazil must be tested according to Method B of ANSI S12.6-1997 (R2002)[14] from which the NRR(SF) –subject-fit is calculated for the label.

PPT efforts to revise the NRR was the motivation for conducting inter-laboratory studies of HPDs in the 1990s and in 2006. The ANSI technical report [20] formed the basis of a new ANSI standard to estimate the effective A-weighted sound pressure level when HPDs are worn. [21] This standard was finalized and will be published in 2007. As an intermediate outcome, this standard is the first ANSI HPD rating standard and has formed the basis of the EPA regulation revision. The standard will affect other countries' regulations as the method gains acceptance within the international community.

What's Next?

The PPT Program will continue to assist the EPA's regulatory efforts to update its regulations that reflect current HPD testing methods and to develop a noise reduction rating that is more directly applicable to users in occupational settings.[20] The revised regulation will include testing and rating methods for new technologies such as sound restoration, communication, active noise reduction, integrated radio, and level-dependent passive HPDs. The PPT Program has partnered with hearing protection manufacturers, (Aearo/EAR, Bacou-Dalloz and Bose Corporation), the U.S. Army Aeromedical Research Laboratory, U.S. Air Force Wright Patterson Air Force Base, EPA, and various universities to develop recommendations for new technologies, assessment methods, and rating recommendations.

Appendix D.1 List of Outputs

Peer Reviewed Publications

Royster JD, Berger EH, Merry CJ, Nixon CW, Franks JR, Behar A, Casali JG, Dixon-Ernst C, Kieper RW, Mozo BT, Ohlin D, Royster LH [1996]. Development of a new standard laboratory protocol for estimating the field attenuation of hearing protection devices. Part I. Research of Working Group 11, Accredited Standards Committee S12, Noise. J Acoust Soc Am 99, 1506–1526.[5]

Franks J, Graydon PS, Chen J, Murphy WJ [2003]. Hearing protector device compendium. http://www2d.cdc.gov/hp-devices/hp_srchpg01.asp.[22]

Murphy WJ, Franks JR, Krieg EF [2002]. Hearing protector attenuation: Models of attenuation distributions. J. Acoust. Soc. Am. *111,* 2109-2116, (2002).[6]

Murphy WJ, Franks JR, Berger EH, Behar A, Casali JG, Dixon Ernst C, Krieg EF, Mozo BT, Ohlin DH, Royster JD, Royster LH, Simon SD, Stephenson C [2004]. Development of a new standard laboratory protocol for estimation of the field attenuation of hearing protection devices: Sample size necessary to provide acceptable reproducibility. J Acoust Soc Am 115 (1): 311-323 [7]

Berger EH, Franks JR [1996]. The validity of predicting the field attenuation of hearing protectors from laboratory subject-fit data. J Acoust Soc Am Vol. 100 No 4 Pt 2, 2674.[23]

Franks JR, Murphy WJ, Johnson JL, Harris DA [2000]. Four earplugs in search of a rating system. Ear & Hearing *21*: 218-226.[24]

Franks JR, Themann CL, Sherris C [1995]. The NIOSH Compendium of Hearing Protection Devices. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 95-105.[25]

Conferences and Presentations

Davis RR, Murphy WJ, Byrne DC [2007]. “A Longitudinal Study of Hearing Protection in Highly Experienced Earplug Users.” USPHS Professional Conference, Cincinnati OH June 4-7, 2007.[26]

Gauger D, Murphy WJ, Berger E, Witt B, Ahroon W, Gerges S [2007]. “Results of an Interlaboratory Study Comparing Method A and B Test Data,” National Hearing Conservation Association Savannah GA Feb 16-17, 2007.[27]

Murphy WJ, Berger EH, Gauger D, Witt B, McKinley R, Gerges, S, Ahroon W. [2006] “Results from the NIOSH/EPA Interlaboratory comparison of ANSI S12.6-1997 Methods A and B.” Acoustical Society of America Meeting Honolulu, Hawaii, Dec. 3-6 [28]

Murphy WJ, Zhu X-D and Kim J.[2006]. “Study of the effect of hearing protectors for military noises based on time-frequency analysis by analytic wavelet transform. Proceedings of Inter-Noise 2006, Honolulu, Hawaii, Dec 3-6.[29]

Franks JR, Davis RR, Murphy WJ [2005]. “Field Measurement of Hearing Protection Device Performance” proceedings of Inter-noise 2005, Rio de Janeiro, Brazil Aug 7-10.[30]

Murphy WJ, Byrne DC, Witt B, Duran J [2005].“Psychophysical uncertainty estimates for real ear attenuation at threshold measurements in naïve subjects” proceedings of NOISE-CON 2005, Minneapolis MN Oct 17-19.[31]

Murphy WJ [2005]. Derivation of an analytic expression for the error associated with the Noise Reduction Rating. Meeting of Acoustical Society of America Vancouver BC, May 2005.[32]

Murphy WJ [2005]. Current Research Issues for Hearing Protectors. Allied Construction Safety Days Conference, Loveland OH, March 8, 2005 [33]

Murphy WJ, Shaw PB [2005]. Calculation of the Intrinsic Error in Hearing Protector Ratings. National Hearing Conservation Association, Seattle WA, Feb 21 2005.[34]

Murphy WJ, Franks JR, Shaw PB [2004]. Estimating the Precision in Hearing Protectors Ratings Acoustical Society of America / New York, NY. May 2004.[35]

Murphy WJ, Franks JR, [2002]. Current status of standards for testing electroacoustic hearing protectors,” J. Acoust. Soc. Am., Vol. 112 No. 5 Pt. 2, 2317.[36]

Murphy WJ, Franks JR [2001]. A reevaluation of the Noise Reduction Rating. Commissioned Officers Association of the US Public Health, Service, Washington DC, May 29, 2001.[37]

Franks JR, Murphy WJ [2000]. Now what do we do with these good numbers? J Acoust Soc Am Vol. 108 No. 5 Pt. 2, 2620.[38]

Murphy WJ, Franks JR [1999]. Progress on a rating system for hearing protector attenuation. J Acoust Soc Am Vol. 106 No. 4, Pt. 2, 2262.[39]

Murphy WJ, Franks JR [1999]. Reducing hearing protector test time with a minimum audible pressure to field transfer function. J Acoust Soc Am Vol. 106, No. 4, Pt. 2, 2238.[40]

Murphy, WJ, Franks, JR, Harris, DA, Johnson, JL [1999]. Four protectors in search of a rating system, J. Acoust. Soc. Am., 105, No. 2, Pt. 2,1132.[41]

Murphy WJ, Franks JR [1999]. A Rating System in Search of Protectors. J Acoust Soc Am Vol. 105 No. 2, Pt. 2,1131.[42]

Murphy WJ, Franks JR [1998]. Analysis of repeatability and reproducibility of hearing protector real-ear-attenuation-at-threshold measured with three fitting methods. Military Audiology Short Course, February 23-26, Albuquerque, NM.[43]

Murphy WJ, Franks JR. [1998]. Analysis of repeatability and reproducibility of hearing protector real-ear-attenuation-at-threshold measured with three fitting methods. National Hearing Conservation Association, February 19-21, Albuquerque, NM.[44]

Murphy WJ, Franks JR, Hall SJ, Krieg EF [1997]. Differences between binaural sound-field thresholds and monaural audiometric thresholds. J Acoust Soc Am Vol. 101, No 5, Pt. 2, 3126.[45]

D.2 Develop Hearing Protection Laboratory and Fit-Testing Methods. (Strategic Goal 3, Objective 3)

Issue

Although NIOSH scientists invented and evaluated the first HPD fit-testing systems in the late 1970s, [46, 47] commercial fit-testing systems were not available until the development of portable computers with high-quality sound capabilities in the late 1990s.[48] Like respirators, HPDs must fit properly or they won't protect the wearer. There is a need to transfer HPD ratings to effective hearing protection for an individual worker on the job. Better test standards and more predictive ratings provide useful population statistics, but are not applicable to the individual worker. The PPT Program identified that fit-testing needs to be performed in conditions with elevated background noise levels and must be able to predict attenuation from limited data.

Approach

The PPT Program pursued a coordinated effort to develop laboratory testing capabilities and evaluate potential fit-testing and rating methods. Also, estimates of the noise attenuation from HPDs in the workplace were developed, as well as validating the new laboratory subject-fit protocol[14] with onsite field-testing methods.[49] In a recent longitudinal study, 90% of workers who were fit-tested achieved protected noise exposures below 85 dB(A).[50]

In 2000, PPT Program scientists met with the senior audiologist of Howard Leight Industries (HLI) responsible for HPD development and testing to specify the requirements for a new laboratory testing system based on commercially available signal generation hardware. This partnership resulted in a laboratory system (HPDLab) suitable for both ANSI and ISO testing of Real-Ear Attenuation at Threshold (REAT).[51] HPDLab testing system uses commercially available signal generation equipment, audio amplifiers, and speakers controlled through software developed by the PPT Program. HPDLab software program incorporated multiple psychoacoustic methods to measure attenuation. The PPT Program developed analyses to estimate protected exposure levels from limited data [52, 53] and to statistically classify the quality of a user's fit based upon the attenuations. [54] The PPT Program studied the performance of proposed fit-testing systems and demonstrated the equivalence of attenuation estimates between ANSI S12.6-1997 Method B and a computer-based fit-test system.[55]

The PPT Program-developed, laboratory-based HPD testing system has lowered the cost of developing new hearing protector testing laboratories. Exclusive of the cost of the reverberant acoustic testing chamber, the HPDLab system can be installed for about $15,000. A comparable commercial system would cost $80,000 or more and would still require many hours of customization work. The HPDLab has been installed in Cincinnati and Pittsburgh as well as the Howard Leight Industries testing laboratory in San Diego.

Output and Transfer Highlights

The HPDLab software and fit-testing research have been the topic of more than 20 presentations at national and international conferences. HPDLab was developed as a tool for the PPT Program

to research testing methods and as a product for commercial testing laboratories with a lowered entry cost. The results of the comparison of field testing methods were published in the American Industrial Hygiene Association Journal. The PPT Program has worked closely with hearing protector industry manufacturers who review NIOSH research findings and proposals.

Intermediate Outcomes

U.S. Army Aeromedical Research Laboratory has installed the NIOSH HPD Lab system for testing hearing protection technologies to develop and test crew communication systems for armored and airborne cavalry units.

Both PRL and HLI laboratory have achieved National Voluntary Laboratory Accreditation Program (NVLAP) for ANSI S12.6-1997.[14] HLI performs in-house testing of its products and has recently completed its portion of the NIOSH-sponsored interlaboratory study with the HPDLab software.

PRL and Cincinnati are developing a multisubject fit-testing system using the HPDLab software code as a basis. These systems will be made available to interested parties to provide mobile fit-testing capabilities.

The PPT Program is working with NASA to develop the third generation of the HPDLab system to make it accessible to a larger base of users and updating the hardware to function on a National Instruments platform using signal generation technology that was previously unavailable in 2001.

External Factors

Gentex Corporation has adopted the NIOSH HPD Lab system, but hasn't been able to devote resources toward installing it.

What's Next?

The PPT Program has contracted with the University of Cincinnati to develop a multi-station fit-testing system that will integrate audiometry and fit-testing into a single testing system built from commercially available signal generation hardware. Once completed, HPDFit will be installed for field testing in mobile testing units such as the PPT Program's mobile audiometric research facility operated out of PRL and in fixed testing facilities such as those found in industry and the military. The PPT Program continues to test the doseBusters USA Exposure Smart Protector (ESP) integrated dosimeter and hearing protection system. Reported doses measured in the occluded position less than 85 dB(A) indicated adequate hearing protection. The ESP represents a novel use of existing technology to monitor the fit of an HPD through continuous sampling of the noise exposure based upon how the protector is worn.

Appendix D.2 List of Outputs

Peer Reviewed Publications

Joseph A, Punch J, Stephenson MR, Wolfe E, Paneth N, and Murphy WJ [2007]. The effects of training format on earplug performance. Accepted for publication to Int. J. Aud. (2007).[56]

Murphy WJ, Franks JR, Berger EH, Behar A, Casali JG, Dixon-Ernst C, Krieg EF, Mozo BT, Royster JD, Royster LH, Simon SD, Stephenson C [2004]. Development of a new standard laboratory protocol for estimation of the field attenuation of hearing protection devices: Sample size necessary to provide acceptable reproducibility. J Acoust Soc Am *115*(1): 311-323.[7]

Franks JR, Murphy WJ, Harris D, Johnson JL, Shaw PB [2003]. Alternative field methods for measuring hearing protector performance. Am Ind Hyg Assoc J *64*(4):501-509.[55]

Berger EH, Franks JR, Behar A, Casali JG, Dixon-Ernst C, Kieper RW, Merry CJ, Mozo BT, Nixon CW, Ohlin D, Royster JD, Royster LH [1998]. Development of a new standard and laboratory protocol for estimating the field attenuation of hearing protection devices, Part III: the validity of using subject-fit data. J Acoust Soc Am *103*: 665-672.[11]

Royster JD, Berger EH, Merry CJ, Nixon CW, Franks JR, Behar A, Casali JG, Dixon-Ernst C, Kieper RW, Mozo BT, Ohlin D, Royster LH [1996]. Development of a new standard protocol for estimating the field effectiveness of hearing protector divides, Part I: Research of working group II, accredited standards, committee S12, noise. J Acoust Soc Am *99*: 1506-1526.[5]

Publications

Murphy WJ, Davis RR, Byrne DC, Franks JR, EPHB Survey 312-11a Advanced Hearing Protector Study: Conducted at General Motors Metal Fabrication Division Flint Metal Center, Flint, Michigan, DHHS-CDC-NIOSH, (2006).[50]

Book/Chapters/Proceedings/Abstracts

Murphy WJ, Byrne D, Witt B, Duran J [2005]. Psychophysical uncertainty estimates for Real Ear attenuation at threshold measurements in naïve subjects. NoiseCon 2005, Minneapolis, MN, Oct. 17.[31]

Murphy WJ, Franks JR, Davis RR. [2005]. Field measurements of Hearing Protection Device Performance. InterNoise 2005 / Rio de Janerio, Brazil, August 6.[53]

Franks JR, Murphy WJ, Suter A [2003]. United States Environmental Protection Agency, Workshop on Hearing Protector Devices. Papers and Proceedings, Washington DC.[57]

Franks JR [2001]. State of the Art: New testing methods and passive hearing protectors. In: Proceedings of Noise Induced Hearing Loss Basic mech., prev. & cont.[58]

Franks J, Berger E [1998]. Personal protection: Hearing protection. In: Stellman J, ed. Encyclopedia of Occup. Health and Safety (4th ed., p. 31.11-31.15). Geneva Switzerland: Int. Labor Office.[59]

Berger EH, Franks JR, Lindgren F [1996]. International review of field studies of hearing protector attenuation. In: Axelsson A, Borchgrevink HM and Hamernik RP, eds. Scientific Basis of Noise-Induced Hearing Loss. New York: Thieme Medical Pub Inc., pp. 361-377.[60]

Conferences and Presentations

Murphy WJ, Franks JR. [2002]. Software development for NIOSH hearing protector testing, J. Acoust. Soc. Am., Vol. 112 No. 5 Pt. 2, 2295.[51]

Murphy WJ, Franks JR. [2000]. A statistical classifier for hearing protector REAT data. J. Acoust. Soc. Am. Vol. 108, No. 5 Pt. 2, 2621.[54]

Franks JR, Harris DA, Johnson JL, Murphy WJ. [1999]. Alternative field methods of measuring hearing protector performance. Abstracts of the Midwinter Meeting of the Association for Research in Otolaryngology, 22.[61]

Murphy WJ. [2000]. Evaluation of a Real-World Hearing Protector Fit-Test System. National Hearing Conservation Association, Denver, CO February 18.[62]

Murphy WJ, Franks JR. [1999]. Evaluation of a FitCheck hearing protector test system. J Acoust Soc Am Vol. 106 No. 4, Pt. 2, 2263.[63]

Murphy WJ, Franks JR, Hall SJ, Krieg EF. [1997]. Differences between binaural sound-field thresholds and monaural audiometric thresholds, J. Acoust. Soc. Am., 101, No 5, Pt. 2, 3126.[45]

Franks JR, Murphy WJ, Simon SD. [1996]. Repeatability and reproducibility in hearing protector testing. J. Acoust. Soc. Am., 99, 2464.[64]

D.3 Evaluate the Effectiveness of Hearing Protection Devices to Provide Protection From Impulsive Noise. (Strategic Goal 3, Objective 4)

Issue

More than 1.8 million U.S. workers are exposed to potentially hazardous levels of impulsive noise. This estimate includes federal, state, and local law enforcement officers, DOD infantry, armor, and artillery personnel, and workers in the construction and mining sectors.[65] In addition, 50% of U.S. industrial workers are believed to be exposed to impulsive noise due to recreational use of firearms in activities such as target shooting or hunting.[66]

High-intensity impulsive sounds are considered to be more damaging to hearing than continuous sounds. Exposure to impulsive sound can cause acute acoustical trauma, which can be followed by symptoms such as tinnitus and temporary hearing impairment. Sudden hearing loss may also occur from exposure to impulsive sounds that exceed a critical sound pressure level by causing direct mechanical damage to the middle and inner ear. [67]

The potential hazard of exposing human test subjects to high impulse levels combined with the lack of sufficiently isolated acoustic test fixtures has limited research in developing hearing protection devices for use in impulsive noise. The EPA labeling regulation states: “Although hearing protectors can be recommended for protection against the harmful effects of impulsive noise, the NRR is based on the attenuation of continuous noise and may not be an accurate indicator of the protection attainable against impulsive noise such as gunfire.”[1] Accordingly, OSHA established a non-enforceable level to a permissible exposure level (PEL) of 140 dB[68] and MSHA has established a PEL of 115 dB(A).[12] To date they are non-enforceable because national guidelines and standardized methods are not available for evaluating the performance of HPDs in attenuating impulsive sounds. However, PPT Program researchers have addressed the need for updated guidance and regulations related to impulsive noise.[69] [22]

Approach

Collaboration with University of Cincinnati applied new analytic metrics to the evaluation of impulse responses for hearing protection devices. Hearing protector attenuation is most often evaluated through real ear attenuation at threshold (REAT) measurements, but can be assessed with a microphone in real ear or using an acoustic test fixture. The PPT Program constructed an acoustic shock tube to generate impulses necessary to measure the level dependent transmission loss of HPDs while mounted on an acoustic test fixture.

The PPT Program is also involved with ANSI and ISO development of testing standards for measuring the performance of HPDs in impulsive environments. In 2001 and 2002, the PPT Program staff evaluated the effectiveness of more than 20 hearing protectors at indoor and outdoor firing ranges with impulses generated by small-caliber weapons and peak impulse levels ranging from 140 to 170 dB sound pressure level (SPL).[69, 70]

The PPT Program is leading efforts to establish national and international standards on characterizing the effectiveness of hearing protection devices against impulsive noise. PPT

Program scientists frequently serve on standards-setting committees providing expertise and an opportunity to disseminate PPT Program research findings and recommendations.

In 2000, PPT researchers initiated a new effort to collect data published by manufacturers of hearing protectors sold in the United States to augment or replace the data collected for the 1994 Hearing Protector Compendium. The electronic version contains updated information on the use of the REAT attenuation values and standard deviations for the purpose of calculating the attenuation. It's available at the following web site: http://www.cdc.gov/niosh/topics/noise/hpcomp.html.

Output and Transfer Highlights

Research efforts on hearing protection devices and their effectiveness against impulsive noise have been presented at national and international professional conferences and in three peer-reviewed journals.[53, 71, 72] Also, PPT Program scientists published an Alert document on hazardous noise at indoor firing ranges in 2007.

PPT Program provided the only external input to the DoD's proposed rule for a design limit criteria for exposure to impulsive noise, MIL STD 1474E .

The PPT Program and the NHCA co-sponsored a Best Practices Workshop on Impulsive Noise and Its Effects on Hearing in 2003. A peer-reviewed publication on the summary and findings from this workshop was published in the Noise Control Engineering Journal.[73]

In November 2005, the PPT Program published a NIOSH Health and Safety website for Indoor Firing Ranges that includes information on NIOSH Health Hazard Evaluations (HHEs), technical documents, publications, and recommendations on reducing exposure to impulsive noise at indoor and outdoor firing ranges. [74]

PPT Program scientists analyzed the impulses using several damage risk criteria and recommended the use of double hearing protection whenever impulses exceed 140 dB SPL. Also, a combination of an electronic level-limiting earmuff and a passive earplug was recommended to improve the communication when using dual protection.

PPT Program scientists published two HHE reports for the Fort Collins Police Service[69] and for the Immigration and Naturalization Service, National Firearms Unit [70]. The reports provided recommendations on the selection and use of appropriate hearing protection devices to limit exposure of law enforcement officers to harmful impulsive sound levels.

A compendium of hearing protectors was published in 1976, followed by successive updates of that information in 1985, 1995, and 2003. PPT Program updated its Electronic HPD Compendium to include information about attenuation of hearing protection devices against impulsive noise.

Intermediate Outcomes

The Department of Homeland Security, U.S. Citizenship and Immigration Service has disseminated PPT Program recommendations on appropriate use and selection of hearing protection devices among all National Firearms Units that are responsible for training more than 19,000 officers, the largest nonmilitary armed force in the federal government.

Major hearing protector manufacturers in the United States report using the NIOSH web-based compendium. For example, in the past year, Bacou-Dalloz reported using the compendium in presentations to more than 200 hearing protector distributors and safety professionals. The organization includes reference to the compendium in its training presentations and refer incoming callers to it through the technical support section.

A Google search on NIOSH Hearing Protector Device Compendium revealed 27 direct links from other sites to the compendium. These links include three union or worker organizations, five university hearing conservation or industrial hygiene programs, six hearing health-related manufacturers, two audiology service providers, six safety organizations, two government entities, and three resellers of hearing protectors.

The Department of Energy (DOE), Oak Ridge National Laboratory is implementing PPT Program HPD recommendations for DOE law enforcement personnel.

OSHA established a non-enforceable level to a permissible exposure level (PEL) of 140 dB and MSHA has established a PEL of 115 dB(A) for impulsive noise, based on PPT Program efforts.

Spurred by the availability and wide use of the compendium, two major manufacturers to date have voluntarily supplied subject-fit data for their products. Although not currently required by the EPA for all hearing protectors, subject-fit data most accurately represent real world hearing protector attenuation. The NIOSH 1998 Criteria Document recommended using subject-fit data because they would eliminate the need to use controversial de-rating schemes.

What's Next?

The PPT Program is involved in dissemination activities resulting from its impulsive noise research. A NIOSH Workplace Solutions document is being written with simple and specific recommendations for preventing and reducing noise-related hazards in the workplace. The PPT Program is developing a new version of the HPD compendium with more efficient methods for search strategies to identify appropriate protection. Also, the PPT Program is developing training materials for proper selection and fitting hearing protection devices for use in impulsive noise environments.

Appendix D.3 List of Outputs

Peer Reviewed Publications

Kardous, CA, Willson, RD, Hayden, CS, Szlapa, P, Murphy, WJ, and Reeves, ER, [2003]. Noise exposure assessment and abatement strategies at an indoor firing range. Appl. Occup. Env. Hyg. 18, 629-636.[75]

Kardous CA, Willson RD, Murphy WJ [2005]. – Noise dosimeter for monitoring exposure to impulse noise. Applied Acoustics Journal, 66 (2005) 974-985.[76]

Publications

Kardous CA [2007]. NIOSH Alert occupational hazards for indoor firing ranges, DHHS-CDC-NIOSH, (2007) In press.[77]

Tubbs, RL, Murphy, WJ. [2003]. NIOSH Health Hazard Evaluation Report: HETA #2002-0131-2898 Fort Collins Police Services, Fort Collins, Colorado. DHHS-CDC-NIOSH, March [2003].[69]

Book/Chapters/Proceedings/Abstracts

Murphy WJ [2003]. Deriving a new NRR from ANSI S12.6B method, inter-laboratory reproducibility of data and precision of the data. U.S. Environmental Protection Agency Workshop on Hearing Protector Devices, Washington DC, March 27 – 28.[78]

Franks JR, Harris DA, Johnson JL, Murphy WJ [1999]. Alternative field methods of measuring hearing protector performance. Abstracts of the Midwinter Meeting of the Association for Research in Otolaryngology.[61]

Conferences and Presentations

Murphy WJ, Zhu X-D and Kim J [2006]. Study of the effect of hearing protectors for military noises based on time-frequency analysis by analytic wavelet transform. Proceedings of Inter-Noise 2006, Honolulu, Hawaii, Dec 3-6, 2006.[29]

Kardous CA, Murphy WJ [2005]. New System for monitoring exposure to impulsive noise, proceedings of Inter-noise 2005, Rio de Janeiro, Brazil Aug 7-10, 2005.[79]

Murphy WJ, Kardous CA, Byrne DC, Zechmann EL[2007]. Auditory risk of hearing loss due to gunshot noise exposure, National Hearing Conservation Association Savannah GA Feb 16-17, 2007.[80]

Kardous CA and Murphy WJ [2007]. Noise abatement for indoor firing ranges, USPHS Professional Conference, Cincinnati OH June 4-7, 2007.[81]

Murphy WJ [2006]. Evaluation of level-dependent hearing protection devices for use with impulse noises. American Industrial Hygiene Conference & Expo (AIHce), May 13-18 in Chicago, Illinois.[82]

Murphy WJ, Franks JR, Behar A. [2004]. Hearing protector labeling for active noise reduction devices. Acoustical Society of America San Diego CA, November 18.[83]

Murphy WJ. [2004]. Evaluation of level-dependent hearing protection devices for use with impulsive noises. American Industrial Hygiene Conference 2004 Noise Symposium, Atlanta GA, May 9.[84]

Murphy WJ. [2004]. Evaluation of level-dependent hearing protection devices for use with impulsive noises. National Hearing Conservation Association, Seattle WA, Feb 21.[85]

Murphy WJ. [2003]. Peak reductions of nonlinear hearing protection devices. National Hearing Conservation Association/NIOSH Best Practices Workshop on Impulse Noise, Cincinnati, OH April 7-8.[86]

Murphy WJ, Kardous CA. [2003]. Attenuation measurements of linear and nonlinear hearing protectors for impulse noise. J. Acoust. Soc. Am., Vol. 113 No. 4 Pt.2, 2195.[87]

Kardous CA, Murphy WJ, Willson RD. [2003]. Personal noise exposure assessment from small firearms. J. Acoust. Soc. Am., Vol. 113 No. 4 Pt.2, 2195.[88]

Franks JR, Murphy WJ. [2002]. Do sound restoration hearing protectors provide adequate attenuation for gunfire noise. J. Acoust. Soc. Am., Vol. 112 No. 5 Pt. 2, 2294.[89]

Murphy WJ, Little MB. [2002]. Performance of electroacoustic hearing protectors. J. Acoust. Soc. Am., Vol. 111 Pt. 5, 2336[90]

D.4 Develop an Integrated Hearing Protection And Communication System. (Strategic Goal 3, Objective 5)

Issue

Hearing protection devices present a challenge for communication in noisy environments. In certain work settings such as firefighting and emergency response, engineering noise controls are difficult, if not impossible, to implement. Workers must instead rely on personal hearing protection, such as standard earplugs, to prevent noise-induced hearing loss. Conversely, worker safety depends on the ability to hear and understand the speech of other workers, plus one's own speech, particularly in a noisy setting. Given the choice between personal safety and hearing loss prevention, workers opt not to wear HPDs because they think that HPDs impair communications. [91] A survey of health and safety professionals found that 65% of those responding thought the workplace would be safer if workers could easily communicate with each other and with supervisors.[92]

Approach

PPT Program researchers developed and built several customized applications of the EarTalk system for trials in auto racing, firefighting, and the military. In 2002, a prototype EarTalk system was tested in high-noise environments at the Voice Communication and Research Evaluation System facility at Wright-Patterson Air Force Base. The tests showed that EarTalk performed as well as current racing communication systems but did not achieve the same level of speech intelligibility as more expensive military communication headsets with noise canceling microphones underneath a noise-reducing muzzle.

Output and Transfer Highlights

EarTalk is a communication device that is incorporated into a HPD that was developed by PPT Program researchers between 1989 and 1991. EarTalk provides workers with the means to communicate clearly with speech while protecting their hearing. The EarTalk device uses a miniature microphone to detect the speech signal in the ear canal of the talker, electronically processes the sound to restore natural sound quality and transmits the signal to miniature speakers in the ear canal for a listener. [93]
Research information has been presented and demonstrated at national and international conferences and expositions.

Four publications and a book chapter have resulted from this research.

Intermediate Outcomes

PPT Program researchers were awarded a U.S. Patent for the EarTalk system in 1991.

EarTalk technology is available for licensing through CDC technology transfer office. To date, one licensee (Cavcom, Inc.) has incorporated EarTalk into a system that works with Motorola

radios commonly used by police and firefighters. Cavcom, Inc. has marketed a modified EarTalk system for more than 2 years.

What's Next?

EarTalk remains as a viable alternative to existing and mostly outdated communication systems, but due to lack of funding and challenges associated with technology transfer of publicly-developed inventions to the private sector, the system's potential has yet to be fully recognized. The CDC and NIOSH technology transfer offices are helping to formulate a new marketing strategy.

Appendix D.4 List of Outputs

Publications

Gwin K, Wallingford K, Morata TC, Van Campen LE [2001]. Hazard evaluation and technical assistance report: Human Performance International, Inc., Charlotte, North Carolina. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, NIOSH Report No. HETA 00-0110-2849.[94]

Stephenson MR, Merry CJ. Hearing Protection for Miners. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 98-151.[95]

Peer Reviewed Publications

Kardous CA [2003]. EarTalk: Protector and microphone. The Military Engineer, No. 621, 43 44.[96]

Morata TC, Fiorini AC, Fischer FM, Krieg EF, Gozzoli L, Colacioppo S [2001]. Factors affecting the use of hearing protectors in a population of printing workers. Noise and Health *4*(13): 25 32.[97]

Book/Chapters/Proceedings/Abstracts

Kardous CA [1998]. Eartalk - Hearing Protector and Communication System in Prasher P., Luxon L., Pyykko I. (eds.), Advances in Noise Research, Volume II: Protection Against Noise. John Wiley.[93]

Conferences and Presentations

Kardous CA [1997]. EARTALK - Hearing Protector and Communication System. Paper and poster presentation at the Second Pan European Conference on Protection against Noise, London, England, June 16-19, 1997.[98]

Patents

Franks J.R., Dunn D.E., Sizemore C.W. [1995]. Ear Based Hearing Protector/Communication System. U.S. Patent # 5,426,719. U.S. Patent and Trademark Office, Washington, D.C.[99]

D.5 Develop Hearing Protection Recommendations for Noise-Exposed Hearing-Impaired Workers. (Strategic Goal 3, Objective 6)

Issue

Of the 19 million U.S. adults estimated to have hearing impairments, nearly half are currently employed.[100] Nine of 10 coal miners, four of seven carpenters, and one of three automobile production workers with at least 20 years of employment have material hearing impairment due to noise exposure.[101-106] Many hearing losses are incurred during the first 5 to 10 years of employment.[107, 108] Workers frequently spend the rest of their careers trying to function in a noisy environment impaired by a hearing deficit.

Hearing impaired workers face a dilemma of needing to protect their residual hearing and also needing to communicate[109-111] and identify environmental cues and warning signals [112] [113, 114] without additional "impairment" imposed by use of conventional HPDs. However, HPD selection is based upon the worker's noise exposure and HPD attenuation characteristics without consideration of hearing impairment.

Noise-exposed, hearing-impaired workers face special problems. Conventional hearing protectors typically improve speech intelligibility for normal-hearing persons; however, hearing protectors degrade speech intelligibility for hearing-impaired listeners.[109-111],[115] Hearing protection also diminishes the ability of hearing-impaired workers to perceive certain warning signals [112, 113] and monitor sounds in the work environment (e.g., equipment noises). Hearing-impaired workers have also been shown have an increased risk of occupational injuries.[114]

Current hearing conservation regulations do not distinguish between workers who have normal hearing and those who have hearing loss. Although the Americans with Disabilities Act of 1990 requires employers to make reasonable accommodation for handicapped workers, it provides no guidelines for managing hearing-impaired workers except those who are completely deaf. No government or professional organization has published guidelines or policies concerning the management of noise-exposed, hearing-impaired workers; therefore hearing conservation professionals do not have the information necessary to make appropriate recommendations to accommodate these individuals.

In the 1988 Proposed National Strategy for the Prevention of Noise-Induced Hearing Loss (NIHL), NIOSH noted that "the job-related consequences of occupational NIHL may threaten a worker's employment status." [116] Rehabilitation and accommodation strategies for noise-exposed, hearing-impaired workers were identified as research needs in the 1998 revision of the noise criteria document. [49]

Approach

In 2002, the PPT Program conducted a series of focus groups and in-depth interviews with noise-exposed hearing-impaired workers, their supervisors, and managers of hearing conservation programs. The objective was to obtain their perspective on the effect that hearing loss and noise

exposure have on safety, communication, and job performance; difficulties encountered; information needed to effectively accommodate these workers; and knowledge of currently-available options. Workers, supervisors, and hearing conservation managers reported that working in noise with a hearing loss does not have much of an effect on worker productivity, but does present a concern for employee safety, particularly regarding communication and the ability to hear important environmental sounds.

Particular jobs require that a worker be able to hear warning sounds and to communicate with other workers. PPT Program scientists are working on methods to establish consistent guidelines for determining the minimum auditory requirements for a job or task. These guidelines will ensure that the safety of the workers is not compromised by hearing impairment. Furthermore, the guidelines will be targeted to prevent workplace discrimination for those hearing-impaired workers when they can be accommodated or when hearing is not critical to performance, productivity, or safety.

Beginning in 2001, PPT Program scientists evaluated alternative hearing protection options, such as flat-attenuation HPDs and the use of hearing aids under earmuffs, to determine their utility in alleviating the special problems faced by hearing-impaired workers. An assessment/intervention protocol for hearing-impaired HPD users was developed from this work and tested in the PPT Program's audiological laboratory. NIOSH, General Motors, and the UAW field-tested the protocol with a group of hearing-impaired, noise-exposed manufacturing employees in Michigan. From this research PPT Program scientists are developing a protocol for selecting the HPDs that will maximize speech intelligibility for a hearing-impaired worker while still providing sufficient reduction in noise exposure. Hearing impaired workers have been recruited and audiometric assessment and speech intelligibility testing are currently in process.

Output and Transfer Highlights

Laboratory research on the effects of earmuff attenuation characteristics on speech intelligibility for hearing impaired subjects was the topic of a Ph.D. dissertation at The Ohio State University of one former HLR staff member. [117] A project protocol has been approved to field-test the models developed from the laboratory findings with hearing-impaired workers in the manufacturing sector. [118, 119]

Research has indicated that warning signals need to be lower in frequency in order to be perceived by workers with hearing loss. In some situations, visual alerting devices may be required, although focus group participants reported that visual signals are not always appropriately placed to be useful.

PPT Program results of this effort are already providing OSHA, MSHA, employers, and professional organizations with needed guidance on managing hearing-impaired individuals who work in noise through consultation and presentations.

What's Next?

Upon completion of the field evaluation, a computer spreadsheet model to estimate the exposure of hearing-impaired workers will be made available as a tool that professionals can use when developing recommendations to accommodate noise-exposed, hearing-impaired workers.

Research will be conducted on how to train workers to maximize residual hearing (listening strategies, lip-reading, optimal use of hearing aids, alternative communication methods). This research need was identified in the 1998 criteria document. It was also recommended as a result of the focus group study, based on comments from participants indicating the extent of their reliance on non-verbal communication techniques. Because these techniques must be learned, new hearing-impaired workers in particular may be at a disadvantage and possibly at increased risk for accidents.

Additional accommodations for hearing-impaired, noise-exposed workers (e.g., alternative warning systems) will be developed and evaluated to recommend a protocol for determining when a particular worker needs such accommodations. Practical recommendations for the accommodation of noise-exposed, hearing-impaired workers will be published as a NIOSH "practical guide" oriented towards the special needs of noise-exposed, hearing-impaired workers.

The research findings in this program will provide input to the ANSI subcommittee on bioacoustics (S3) or noise (S12) to develop a method of predicting the ability of an individual to communicate in noise while wearing hearing protection.

Appendix D.5 List of Outputs

Peer Reviewed Publications

Morata TC, Themann CL, Randolph RF, Verbsky BL, Byrne DC, Reeves ER [2006]. Attitudes and beliefs about hearing loss prevention among workers with self-reported hearing difficulties. *Ear & Hearing* (in press).[120]

Book/Chapters/Proceedings/Abstracts

Verbsky BL [2002]. Effects of conventional passive earmuffs, uniformly attenuating passive earmuffs, and hearing aids on speech intelligibility in noise. Doctoral dissertation, The Ohio State University.[117]

Conferences and Presentations

Randolph R [2004]. Working Impaired in Dangerous Settings: What the What the Workers Tell Us. Platform presentation at the National Hearing Conservation Association annual conference.[121]

Verbsky BL [2004]. Accommodation of hearing-impaired workers in noise. Research podium presentation, Annual Convention of the American Academy of Audiology.[122]

Verbsky BL [2003]. Hearing aids + earmuffs: Safe & effective within limits. Poster presented at the National Hearing Conservation Association annual conference.[123]

Verbsky BL, Feth LL [2002]. Hearing conservation: Hearing protection versus speech intelligibility and personal safety. Poster presentation at the 2002 meeting of the American Auditory Society.[124]

D.6 Develop and Improve Fall Arrest Harnesses. (Strategic Goal 3, Objective 7)

Issue

Falls are second only to motor-vehicle crashes as a leading cause of death and injury in the workplace. Falls cause 313,000 disabling injuries to American workers, and more than 700 deaths each year. Falls from elevation are a special concern. On average, 651 American workers die and nearly 86,900 suffer injuries each year as a result of falls from elevation. [125] The cost of a single fall-from-elevation injury usually starts at around $500,000 and easily reaches $1 million or more when third-party suits are involved in severe injury cases.

The construction industry has the highest frequency of fall-from-elevation incidents, followed by the wholesale and retail trade, service, and transportation industries. Most often, construction workers fall from roofs, ladders, and scaffolds. OSHA regulations require that fall-arrest harnesses, guardrails, or safety nets be used as protective measures for tasks that are performed above 6 feet of height. In some cases, engineering controls such as guardrails or safety nets are inadequate or impractical, and are therefore not implemented. In these cases, if the work cannot be redesigned to prevent or reduce fall-from-elevation hazards, personal protective equipment is often used. One type of PPE that is widely used during various construction phases is the fall-arrest harness.[126]

Fall-arrest harnesses provide the last line of defense for the 10.8 million construction workers in areas where fall hazards cannot be completely eliminated. Full-body harnesses, which replaced waist belts and chest-waist harnesses more than 10 years ago, are considered the standard body support components of personal fall-arrest systems in the United States and Canada. [127] Despite the important role played by harnesses as protective devices in construction and general industry, there are problems associated with them that can impact whether or not they are used at all, and if they are used, whether they are safe.

First, fall-arrest harnesses must be properly fitted and sized for individual workers. The Anthropometric (human body measurement) data used in current harness designs are based on studies with military personnel conducted in the 1970s and 1980s, and do not represent the current general U.S. worker population. Also, workforce demographics have changed, with more women and minorities employed in occupations that use harnesses. Resulting changes in the anthropometric characteristics of workers using harnesses mean that current sizing data may be inadequate and potentially dangerous.

Second, workers wearing harnesses who fall and are suspended in the harnesses may be at risk of "Suspension Trauma." Research has shown that subjects experience respiratory distress within 5 to 30 minutes of suspension in a full-body harness. Information is lacking on how full-body fall harnesses fit workers when they are suspended after a fall.[128] Updated information on human tolerance in suspended postures and on solutions to minimize suspension trauma is needed.

Little has been published on either proper fit and sizing of harnesses, or the risks and exposures associated with workers being suspended after falls arrested by harnesses. These current limitations in harness design can result in non-use of harnesses, improper size selection, failure

to don harnesses properly, and poor harness-user interfaces, each of which may result in increased risk. Advanced technology and methods available through the NIOSH PPT Program provide unique capabilities for developing sizing schemes and redesigning harnesses to provide safe, user-friendly, and ergonomically appropriate designs.

Improvements in fall-arrest-harness sizing and design could reduce the risk of worker injury.

Another distinct PPT research effort is examining potential improvements in footwear designs that might reduce risks of 1) fall-from-elevation-related injuries and fatalities for workers on roofs and other elevated work areas, and 2) slip, trip and fall (to the same level) risks for healthcare and other service workers.

Approach

The overall goals of the research effort focused upon fall-arrest harnesses are
1) The establishment of anthropometric guidelines for the design of improved full-body harnesses
2) The development of effective harness-sizing systems that will better accommodate the current population of U.S. workers, and
3) The reduction of physiologic stresses experienced by workers suspended in fall-arrest harnesses after a fall.

The PPT Program used an advanced scanning technology to perform rapid (17-second) whole-body 3D scans of workers in both standing and suspended conditions. Tests with traditional, time-intensive anthropometric tools and methods are unacceptable for testing human subjects suspended in harnesses, since respiratory distress can occur in as little as 5 minutes.

The PPT Program then evaluated the range of body shapes accommodated by current sizing schemes and tested current static fit criteria for their usefulness in determining how well harnesses fit after a fall. Findings from these studies of workers in the construction trades showed that 24% to 40% of participants failed fit criteria for two types of harnesses, confirming the need for more accurate data on the interface between the human body and safety harnesses.

Mathematical parameters were established to determine the points of contact between the human body in its various shapes and the safety harness, and to define optimal sizing schemes. Thigh strap angle and harness back D-ring location were identified as additional critical static-fit-test criteria to predict post-fall harness fit. The power of these studies was increased through the addition of data from an international anthropometric database of 2,340 subjects, known as CAESAR (Civilian American and European Surface Anthropometry Resource). CAESAR was developed through use of a similar 3D scanning procedure by a consortium of industrial and government agencies.

Along with two harness manufacturers, the PPT Program team has applied the mathematical parameters developed through the PPT pilot studies to the CAESAR database to establish the adjustment range of each harness component. This is an important step to enable transfer of the scientific research results into industrial design practice. The PPT Program is one of the few

international programs with the ability to perform 3D digitization research and human-harness-interface modeling for harness design applications.

Further, PPT Program scientists conducted experiments to determine the amount of time persons can withstand suspension in properly-sized harnesses, as well as a human physiology study to determine effectiveness of an intervention to reduce physiologic stress to workers suspended in harnesses. The intervention was a harness accessory invented by PPT researchers. After a fall, this accessory automatically supports a wearer in a sitting position with the knees elevated at a position at or above the hips. It was found to increase suspension times for subjects. Mean suspension time was measured at 58 minutes (range 39 to 60 min) for the tests with the harness accessory, but only 29 minutes (range 5 to 56 minutes) for tests without the accessory. Two major harness manufacturers (Mine Safety Appliances Co. and DBI-SALA Fall Protection Inc.) have actively participated in this research and are working with the PPT research team to finalize the adjustment range of each harness component. These manufacturers have provided original static-test criteria, harness blueprints, and technical input for each study, and have continued to provide feedback on proposed new sizing systems. They also are developing harness prototypes based on the proposed sizing systems and other NIOSH Program study results reported above.

The principal goals of the research effort examining shoes are
1) The development of improved designs for footwear used in work on roofs and other elevated surfaces, including sensory-enhancing technology that can improve worker balance, and
2) The development and evaluation of new sole designs to reduce risk of slips, trips, and falls to the same level among service workers.

PPT researchers developed a surround-screen virtual reality (SSVR) system, the first SSVR system in the world designed for occupational fall prevention research. Validation studies have confirmed that the SSVR system is a valid tool for fall-from-roof prevention research. The system is currently used to evaluate human performance at elevation, identify risk factors leading to fall incidents, and assess new fall prevention strategies and technologies. One effort using the SSVR system addressed how improvements in footwear could reduce injuries and fatalities from falls. In addition to findings that identify footwear design features that improve worker stability and balance, sensory-enhancing technology has been used in the engineering of “smart” shoe inserts to improve workers' balance on roofs. A prototype “smart” shoe with random vibration insert has been constructed. The ability of this technology to reduce the risk of falling has been demonstrated in SSVR laboratory tests. Improved footwear designs for work on roofs have been developed based upon this research effort.

Program researchers are also addressing slip, trip, and fall hazards faced by healthcare and other services workers, among whom injuries from falls to the same level often occur. New footwear sole designs were developed based on analysis of 6 years’ data on slip, trip, and fall injuries among hospital workers. Researchers identified surfaces that presented the greatest risk of slip and trip-related injuries for healthcare workers. PPT researchers also conducted finite element modeling of the knee as part of its ongoing research into identifying slip, trip and fall hazards, and developed a training module for maintaining “healthy knees.”

Output and Transfer Highlights

The research report on current harness-sizing issues and the effect of thigh strap angle and back D-ring location as additional harness static-fit-test criteria to enhance post-fall harness fit was published in the journal *Ergonomics* in 2003. The research received the prestigious International Ergonomics Association (IEA) Liberty Mutual Prize in Occupational Safety and Ergonomics in 2002. The information in the article can help construction employers and workers select the right size and proper donning of harnesses.

Findings from the human physiology study regarding the use of intervention technology to reduce the potential of suspension trauma were presented at the American Industrial Hygiene Conference and Exposition in 2006.

A provisional patent application was filed on July 14, 2006 for this intervention technology—a harness accessory that automatically supports a wearer in a sitting position with the knees elevated at a position at or above the hips after a fall (CDC Ref. No. I-002-06). The information, along with the harnessing research results, will be shared with harness manufacturers for the new generation harness design.

A provisional sizing scheme with an algorithm that describes the human torso shape-and-size distribution and a set of recommendations for producing vest-type harnesses has been accepted for publication by the Human Factors journal. A simplified version of the provisional sizing schedule was presented at the Ergonomics Society Conference and published in Contemporary Ergonomics in 2005. The draft report of a second provisional sizing scheme has also been shared with MSA and DBI-SALA.

Results from the study of suspension trauma, which provided data on the amount of time persons can withstand suspension in properly-sized harnesses, were disseminated to standards-setting organizations, such as the International Society for Fall Protection (ISFP) and American Society of Safety Engineers (ASSE).

PPT researchers reported on the use of virtual reality in studying falls from elevation at the National Occupational Injury Research Symposium in 2000, and at the Human Factors and Ergonomics Society 46th Annual Meeting in 2002. Staff members from the Finnish Institute of Health and the Japan Occupational Health University have expressed interest in adopting the SSVR concept as a foundation for developing their fall prevention research laboratories. NIOSH researchers have used the technology to identify human fall mechanisms and evaluate engineering concepts for fall-from-roof prevention.

The PPT Program used virtual reality technology to evaluate the effects of different styles of footwear on workers' instability at elevation and has reported results to the safety scientific community. Workers' balance on elevated and narrow surfaces was significantly improved with footwear styles that had high uppers and provided good motion control. Proper shoe selection and improved design of specialized work footwear would enhance workers' stability at height. An article detailing these findings was submitted to the journal Ergonomics in 2006.

In collaboration with researchers from Boston University, construction program researchers built and tested a prototype randomly vibrating ("smart") shoe insert to improve workers' balance at

elevation. The smart-shoe insert increases the pressure-sensitivity under the feet by inducing below-sensory-threshold mechanical vibrations.

Additional outputs included a report on the analysis of slip, trip, and fall injury data of hospital workers; a finite element model of the knee; and a training module for maintaining "healthy knees."

All efforts under this sub goal area are at the stage of transferring knowledge and technologies developed through research to research organizations and private-sector companies for further development and commercialization. The processes of transfer and commercialization can proceed for years before products are realized, marketed, and implemented in workplaces to reduce risk, thereby reducing injuries and fatalities. Although there are no end outcomes to report, there are promising intermediate steps to report.

Intermediate Outcomes

Mine Safety Appliances Co. (MSA) and DBI-SALA Fall Protection Inc. are currently developing prototype harnesses that incorporate the PPT sizing scheme. MSA also has indicated interest in more extensive efforts to develop next-generation harness designs and prototypes using the criteria and schemes identified by the PPT Program. MSA was strategically selected to participate in the PPT pilot studies in 2000 because company officials had previously expressed interest in revising fall protection designs using updated human form measurements. Both MSA and DBI-SALA also responded to a NIOSH announcement in the Federal Business Opportunities in 2003 for partnership in harness-sizing studies and in transferring the knowledge to design and commercialization. Since the two manufacturers account for about 60% of the national market share of fall-arrest harnesses, the future adoption potential of the new harnesses and sizing systems in the construction trades is very high

External Factors

In the United States, worker training on regulations (i.e., use of guardrails, safety nets, or fall-arrest systems) has for decades been the primary focus for preventing falls. However, many construction activities have been exempted from the regulatory requirements for practical reasons (i.e., technology, cost, and operation). In addition, research aimed at preventing falls has been hindered because of the difficulty in accessing work environments and worker activities at elevation (even with management and workforce cooperation), the dynamic nature in the construction industry, and the potential injury risk to researchers. Also, testing new engineering solutions at elevated construction sites can expose workers to additional fall exposures and risks. Consequently, the fatalities and injuries associated with falls from elevation have remained high for decades. PPT Program efforts to better understand human fall mechanisms and develop innovative and cost-effective solutions, such as modified protective equipment, along with recent advances in virtual reality, wireless sensing, and remote measurement technologies, have enabled researchers to more effectively evaluate engineering interventions for fall protection.

Support from stakeholders—including the MSA, the American Society of Safety Engineers (ASSE), the International Safety Equipment Association (ISEA), the International Society for Fall Protection (ISFP) and California OSHA—has helped the PPT Program obtain resources to

advance scientific knowledge on formulating harness-sizing schemes and harness designs for various populations, including women and minorities, to assure the required level of protection, productivity, and comfort of harnesses to workers. Active participation from MSA and DBI-SALA Fall Protection Inc. is facilitating the transfer of research to industry practice.

What's Next?

Reduction of fall incidents requires
1) a full-scale analysis of all the data resources to determine the types of injuries that are occurring and the causes of these injuries
2) full-scale analyses of existing protective measures for falls
3) the transfer of current knowledge on fall *prevention* and *protection* into industrial practices
4) further understanding of the biosciences underlying human falls,
5) development of innovative *fall-prevention* strategies and improved *fall-protection* technologies,
6) research and development of a scientifically comprehensive yet easy-to-use model for fall-incident investigations, worker training to recognize fall hazards, and evaluation of worksite designs for fall-hazard control and
7) a public/workforce education campaign on fall prevention and evaluation of effectiveness of fall prevention strategies.

To effectively reduce the number of fall incidents nationally, research should focus on construction, service, and wholesale and retail trade industries. Industry, labor, and professional organizations understand the need for, and have a desire to support fall-prevention research, but have difficulty investing in the sophisticated test facilities, integration of multiple science fields, and significant initial research costs required. In truth, no single organization can provide the level of resources needed. The existing rich partnership among NIOSH, health service companies, safety equipment associations, and safety professional societies has laid the foundation for expanding national and international efforts in occupational fall prevention.

Appendix D.6 List of Outputs

Peer Reviewed Publications

Hsiao H, Whitestone J, and Kau T [2006]. Evaluation of fall-arrest harness sizing scheme. *Human Factors 48*. [in press] [129]

Simeonov P, Hsiao H , Powers J, Ammons D, Amendola A, Kau T, Cantis D [2006]. Footwear effects on walking balance at elevation. (submitted to the Ergonomics) [130]

Hsiao H, Bradtmiller B, Whitestone J [2003]. Sizing and fit of fall-protection harnesses. Ergonomics *46*(12): 1233 1258.[131]

Hsiao H, Long D, Snyder K [2002]. Anthropometric differences among occupational groups. Ergonomics *45*(2): 136 152.[132]

Conference Papers and Presentations

Turner N, Weaver D, Whisler R, Zwiener J, Wassell J [2006]. Suspension tolerance in men and women wearing safety harnesses, presented at the American Industrial Hygiene Conference and Exposition, Chicago, IL, 2006. (Abstract No. 144) [133]

Hsiao H [2005]. Falls Prevention (keynote speech), Slip, Trip, and Fall Symposium, the Ergonomics Society annual conference (UK), 2005.[134]

Hsiao H, Whisler R, Kau T, Zwiener J, Guan J, and Spahr J [2005]. Constructing new harness with charts using 3D Anthropometric Information. *Contemporary Ergonomics 3*:7, April 4 – 7, 2005, Hertfordshire, England.[135]

Pan C, Hoskin A, Lin M, Castillo D, McCann M, Fearn K [2005]. Incidents due to aerial work platforms. Proceedings of XVIIth World Congress on Safety and Health at Work, Orlando, FL, 2005.[136]

Friess M, Rohlf FJ, Hsiao H [2004]. Quantitative assessment of human body shape using Fourier analysis, in proceedings of SPIE—The International Society for Optical Engineering Conference, January 18-22, 2004, San Jose, California.[137]

Hsiao H [2004]. Anthropometric procedures for design decisions: From flat map to 3D scanning. Contemporary Ergonomics, proceedings of the Ergonomics Society Conference in April 2004. Boca Raton, FL: CRC Press, pages 144-148.[138]

Lineberry GT, Scharf T, Jameson R, McCann M, Sulecki R, Wiehagen WJ [2002]. An educational intervention for extension ladder set-up and use. In Power Through Partnerships: 12th Annual Construction Safety and Health Conference, Proceedings May 21-23, 2002, Rosemont, IL.[139]

Ramani R, Flick J, Radomsky M, Russell G, Calhoun B, Haggerty J, Kowalski K, Rethi L, Stephenson CM, Wiehagen B, Scharf T [2002]. Hazard recognition: Fall prevention in construction, Best Practices in Occupational Safety and Health, Education, Training, and Communication: Ideas That Sizzle, 6th International Conference, Scientific Committee on Education and Training in Occupational Health, ICOH, In Cooperation with The International Communication Network, ICOH, Baltimore, Maryland, USA, October 28-30, 2002.[140]

Simeonov P, Hsiao H, Dotson B, Ammons D [2002]. Comparing standing balance at real and virtual elevated environments, Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting 2002, Sep-Oct, 2169-2173.[141]

Hsiao H, Dotson BW [2000]. Safe work at elevation through virtual reality simulation. NOIRS 2000--Abstracts of the National Occupational Injury Research Symposium 2000, Pittsburgh, PA, October 17-19, 200, Pittsburgh, PA: National Institute for Occupational Safety and Health, 60-61.[142]

Pan CS, Chiou S [1999]. Slip and fall: Fall protection in construction safety. Industrial and Occupational Ergonomics: Users' Encyclopedia. Cincinnati, OH: International Journal of Industrial Engineering. Apr; :CDROM (1-9).[143]

Casini V, Lentz TJ [1998]. NIOSH - a resource for occupational health and safety support. Tower Times 4(10):35/37. October 1998. http://www.natehome.com/98/tt1098.html [144]

Bradtmiller B, Whitestone J, Feldstein J, Hsiao H, Snyder K [2000]. Improving fall protection harness safety: Contributions of 3-D scanning. In Scanning 2000—Numerisation 3D, 5th ed. Proceedings of the Industrial Congress on 3D Digitizing, Paris, France, May 24-25, 2000. Dinard Cedex, France: Harbour, pp. 117-128.[145]

Patents

A provisional patent application was filed on July 14, 2006 for a harness accessory which automatically supports a wearer in a sitting position with the knees elevated at a position at or above the hips after a fall (CDC Ref. No. I-002-06).[146]

D.7 Select and Develop Vibration Isolation Devices to Reduce Hand-Arm Vibration Syndrome. (Strategic Goal 3, Objective 8)

Issue

As far back as 1911, scientists associated vibration from hand-held tools with the risk of pain, numbing, and blanching of the fingers, known as vibration white finger. However, even now, many key aspects of the problem are not well understood, hampering efforts to identify worker populations at risk and to design effective control measures.

Figure D.7.1 - A vibrating pneumatic hand-tool operator in the later stages of Hand-Arm Vibration Syndrome

Powered hand-tools such as chipping hammers, grinders, chainsaws, rock drills, road breakers, and riveters are widely used in several industries such as foundries, automobile manufacturing, forestry, construction, mining, and bridge construction. Hand-arm vibration syndrome (HAVS) is one of the major diseases among more than one million U.S. workers exposed to hand-transmitted vibration (HTV). Prolonged, extensive exposure to HTV is strongly associated with HAVS. The most well-known component of HAVS is termed vibration-induced white finger (VWF). Although HAVS has been studied for more than 80 years, the mechanisms of the syndrome are not sufficiently understood. It is still inconvenient, expensive, and technically difficult to accurately measure tool vibration and to assess related exposure factors such as applied forces and postures. The diagnosis of the disease still mainly depends on subjective questionnaires. Many aspects of current risk assessment methods have not been validated. [147]

Operating powered hand-tools such as chipping hammers and rock drills frequently requires forceful and repeated push and grip actions to control the tools and achieve desired productivity. Many of these tools are also known to generate high magnitudes of hand-transmitted vibration. A tight hand-tool coupling imposes high stresses on the anatomical structure of the hand-arm system and impedes peripheral circulation; it also increases hand-arm vibration (HAV) transmissibility.[148] Further studies on HTV exposure and health effects are required. Anti-

vibration gloves are increasingly being used as PPE to help reduce the hazards of hand-transmitted vibration.

In the late 1980s the first A/V gloves were introduced with viscoelastic glove liners. A Japanese firm introduced an A/V glove design using an air bladder inflated with a small bellows pump. Through the years improvements have been made and viscoelastic materials (such as GELFOM made by Chase Ergonomics Co.)[149] and A/V glove design have been introduced. In 1988, ANSI introduced the first A/V glove testing standard (ANSI S3.40) [150], but now the ISO A/V glove standard (EN ISO 10819) governs the vibration isolation glove designs.

Approach

Conduct Research to Reduce Exposure to Hand-arm Vibration Injuries

The PPT Program on HTV is aimed at:
1) conducting comprehensive studies of the biodynamics of the fingers-hand-arm system using advanced vibration testing and measurement methods, and finite element modeling;
2) developing practical and efficient methodologies to measure hand-applied forces and to assess hand-arm postures when using powered hand-tools;
3) understanding the cellular, physiological, and pathological effects of vibration exposure using animal models;
4) using human subjects to determine the acute effects of vibration exposure on physiological measures such as the vibrotactile perception threshold shift, the thermal perception threshold shift, and blood circulation changes in the fingers and hand;
5) establishing new frequency weightings and dose-response relationships for risk assessments of the major components of hand-arm vibration syndrome;
6) developing more effective vibration measurement methods, devices, and expert systems so that non-experts can carry out reliable and accurate measurements; and
7) investigating the effectiveness of vibration isolation devices such as anti-vibration gloves and sleeves through tests using an instrumented vibrating handle that simulates specific tools and vibration characteristics.[147]

NIOSH is pursuing studies to help fill those critical gaps and point to ways for effectively reducing risks of hand-vibration disorders for employees who use jackhammers, chipping hammers, power drills, and other vibrating tools. Individually, the studies focus on particularly complex, challenging areas where new data likely will advance the understanding and prevention of job-related hand-vibration disorders. Collectively, the studies constitute a balanced, interlocking program of strategic research. Current projects include:

- Using advanced microscope technologies to determine if adverse effects from vibrating tools can be predicted from physical changes in the capillaries at the base of the fingernail cuticle, too small to see with the naked eye.

- Developing a computer model of stress and strain on the fingertips from vibrating tool handles, as measured by the degree to which the soft tissues of the fingertips are compressed or displaced by the vibrating handle, as another potential way to flag early warning of adverse effects.

- Assessing infrared thermal imaging of the hands as a potential method for identifying the presence and severity of hand-arm vibration syndrome. This is based on research showing that the temperature of the fingertips – after exposure to cold – returns to normal more slowly in a person with hand-arm vibration syndrome than in a person without HAVS.

- Designing a test method for simultaneously measuring the impact of a chipping hammer bit and the degree of vibration from the handle. The method would give scientists a way to determine if control measures effectively minimize vibration without diminishing the chipping hammer's performance.

- Investigating the effectiveness of anti-vibration gloves through tests using an instrumented vibrating handle that simulates specific tools and vibration characteristics.

Contribute to Standards to Reduce Exposure to Hand-arm Vibration Injuries

Anti-vibration gloves have been used to help reduce the severity of vibration exposure. The vibration attenuation performance of conventional and anti-vibration gloves has been widely evaluated using the method outlined in ISO-10819 (1996).[151] Many studies have recognized shortcomings of the standardized method, specifically measurement errors caused by geometric misalignments of the palm-held adaptor and inter- and intra- subject variability. Additional errors may also arise from dynamic interactions among the human hand, adaptor, handle and the electro-magnetic vibration exciter. A systematic analysis of error sources could yield improved methods to assess the gloves' anti-vibration potentials.[152]

Evaluate Technologies to Reduce Exposure to *Hand-arm Vibration Injuries*

Although the importance of hand coupling force has been recognized, the current international HAV assessment standard (ISO-5349-1, 2001a) [153] has not accounted for this factor. This is partially due to the lack of a practical method for quantifying the hand coupling force. Several approaches have been proposed to modify the assessment methodology to include the hand force effect. An international committee has drafted a working document in an effort to develop a generally acceptable method for quantifying hand coupling forces (ISO/WD 15230, 200 lb).[154] While it is technically feasible to accurately measure hand forces using instrumented handles or flexible force sensors, quantifying hand forces applied to tools in the workplace remains a formidable task. As a convenient approach, a psychophysical technique called magnitude-reproduction or the force matching method has been used to quantify various hand and arm forces. However, using this technique for measuring hand forces applied to vibrating tools has not been seriously studied. To examine and refine this technique, NIOSH researchers have planned a series of systematic studies. [148]

The ISO-10819 (1996) recommends design of an instrumented handle and specifies a palm-held adapter for laboratory assessment of anti-vibration performance of gloves. Although these designs and test procedures have been widely used, many studies have acknowledged a relatively high degree of measurement error associated with the test fixture design. The dynamic behavior of the recommended test fixture (handle and adapter), coupled with the human hand, tends to alter the standardized vibration inputs to the glove and result in potential undocumented test

errors. In a PPT Program study, the dynamic characteristics of the handle-adapter system were investigated to identify their contribution to the potential measurement errors, and an improved design of the instrumented handle was developed to reduce the potential errors.[155]

International standard ISO 10819 was established to quantify the vibration attenuation characteristics of anti-vibration gloves. One problem that exists with the standard is possible misalignment of the palm adaptor placed underneath the test glove. If the adaptor becomes misaligned, the measured glove transmissibility will be lower than the actual value. A tri-axial accelerometer was installed in the adaptor and used as the basis for providing visual feedback of the adaptor alignment to the test subjects.

A NIOSH study was conducted to test the hypothesis that adaptor misalignment could be reduced by providing feedback to the test subjects. Eight male volunteers (mean age 24.8 yr) each performed two sets of tests: the standard ISO 10819 glove test and the modified version. Three different anti-vibration gloves were tested. Glove transmissibility and adaptor misalignment were calculated for each glove. A three-way analysis of variance was used to analyze the results. A comparison of the two testing methods showed that the modified glove testing method did reduce misalignment significantly, which, in turn, resulted in an increase in the measured glove transmissibility. The proposed method greatly improved the standard deviation of transmissibility and made the test results more consistent.[156]

A test method based upon total effective acceleration transmissibility (TEAT) is proposed to study the vibration isolation performance of anti-vibration gloves. The vibration transmission characteristics of three different gloves are investigated under predominantly axial vibration using the proposed method and the procedure outlined in ISO-10819. The measured data were analyzed to illustrate the errors arising from misalignments of the response accelerometer within the palm-held adaptor, unintentional non-axial vibration caused by the vibration exciter and dynamics of the coupled hand-handle system. Variations could cause measurement errors in excess of 20%. The vibration transmission characteristics of selected gloves, evaluated using the proposed method, were compared with those derived from the standardized method to demonstrate the effectiveness of the TEAT approach. It was concluded that the TEAT method can account for the majority of the measurement errors and yield more repeatable and reliable assessments of gloves.[157]

The effectiveness of the transfer function method was examined using two typical vibration-attenuation gloves when used in conjunction with two different pneumatic chipping hammers. Six adult male subjects participated in the experiments involving measurement of gloves transmissibility while operating the selected tools. A comparison of the measured vibration transmissibility with the predicted values revealed that the transfer function method provides a reasonably good prediction of the vibration isolation performance of the gloves. The differences between the predicted and measured mean values of the weighted transmissibility were small. It was concluded that the transfer function method can serve as an effective and convenient approach for estimating the effectiveness of anti-vibration gloves when used with pneumatic chipping hammers. A pneumatic chipping hammer is considered to represent a critical case for the evaluation of the method because they are typical percussive tools that generate impact

vibration, and the method may also be widely employed to predict anti-vibration glove performance when used with many other vibrating tools.[158]

A methodology to estimate vibration isolation effectiveness of anti-vibration gloves as a function of specific tools' handle vibration is proposed on the basis of frequency response characteristics of the gloves. The handle vibration spectra of six different tools were synthesized in the laboratory and attenuation performances of two different gloves were characterized under tool vibration, and M- and H-spectra defined in ISO-10819 (1996). The vibration characteristics of gloves were measured using three male subjects in the laboratory under different excitation spectra. The results suggested that tool-specific vibration isolation performance of a glove cannot be derived from the standardized M- and H-spectra and that frequency response characteristics of gloves were relatively insensitive to the magnitude of vibration but strongly dependent upon visco-elastic properties of the glove materials. It was concluded that the isolation effectiveness of gloves for selected tools can be effectively predicted using the proposed methodology.[159]

The instrumented handle and a palm-held adapter recommended in the ISO 10819 standard were evaluated systematically to identify their potential contributions to the overall measurement errors. The results revealed a nonuniform distribution of vibration along the handle surface. The results also revealed the presence of considerable magnitudes of nonaxial source vibration caused by the nonaxial nature of the feed force imparted by the human hand. An alternate design of the handle achieved a more uniform distribution of vibration. Three alternative methods were proposed to minimize the contributions due to adapter misalignment and the nonaxial source vibration. An error contour method was proposed to predict the influence of the dynamic features of a handle on the measurement of effective vibration. The characterization methods developed in this study may also be applicable to other types of instrumented handles for the study of hand-arm vibration.[160]

In another PPT Program study, the effectiveness of anti-vibration gloves was investigated through examination of their vibration transmission characteristics. The findings indicated that only a few glove designs can reduce vibration transmitted to the palm of the hand, and the effectiveness of anti-vibration gloves depends upon the tool or the vibration spectrum. Moreover, the anti-vibration gloves yield considerably better vibration isolation when used with high frequency tools than that attained with low frequency tools. The assessment and prediction methods could aid in the selection of appropriate anti-vibration gloves for different tools and working conditions.[161]

Several technical difficulties have been associated with test and evaluation methods for assessing the vibration isolation effectiveness of anti-vibration gloves. The effectiveness of the gloves for specific powered hand-tools can be assessed through measuring acceleration on the head of the third metacarpal or at the wrist. In the present study, the reliability of these on-the-hand measurement methods is evaluated through assessing the vibration transmissibility of gloves while operating chipping hammers. Two different methods, with and without the prior knowledge of tool vibration, for deriving the transmissibility of the gloves are also evaluated. The study used an air bladder glove and a gel-filled glove, two chipping hammers, and feed forces in the 50-200 N range. Six male volunteers were used as test subjects. The transmissibility of the gloves is also estimated using a total vibration transfer function method. The results

suggest that the on-the-hand methods offer some unique advantages over the palm adapter method outlined in ISO-10819, but they suffer from poor repeatability when a high degree of tool vibration variability is observed, especially if the tool vibration is not measured and used for the assessment. Glove transmissibility measured at the third metacarpal is more repeatable than that derived from the measurements at the wrist. Agreements were observed between the predicted and measured transmissibility values of the air glove. However, the measured transmissibility values for the gel-filled glove suggest that it may perform better than as predicted using the transfer function method. [162]

In 2004, PPT Program conducted a study to determine the vibration isolation effectiveness of a typical (air bladder) anti-vibration glove as a function of vibration frequency, and to investigate the effects of hand-tool coupling action and applied force level on the effectiveness. Six male volunteers were used in the study. A palm adapter method similar to that recommended in the current ISO standard for anti-vibration glove testing (ISO-10819, 1996) was used to measure the transmissibility of the glove. Three different handgrip actions (grip-only, push-only and combined grip and push), three force levels (50, 75 and 100 N), and a broad-band random spectrum were used in the experiment. This study found that the effectiveness of the glove generally increased with an increase in vibration frequency, while the glove did not provide any effective vibration isolation at frequencies less than or equal to 25 Hz. Under the same force level, the push-only action produced the greatest vibration attenuation while the grip-only action resulted in the lowest glove performance among the three actions. Increasing the force tended to increase vibration transmissibility at low frequencies (31.5 Hz), while transmissibility decreased at the middle frequencies (63 - 250 Hz).[163]

In 2005, a PPT Program study aimed to identify major individual factors that are directly associated with the effectiveness of anti-vibration gloves. This study found that the vibration transmissibility of the glove was reliably correlated with the apparent mass in the frequency range of 40-200 Hz; and that the glove became more effective when the apparent mass was increased. This study further identified the effective stiffness of the hand-arm system at frequencies from 63 to 100 Hz as the key factor that influenced the biodynamic response and the glove transmissibility measured at the palm of the hand.[164]

In a 2005 study, the PPT Program proposed an alternative method to assess the vibration isolation effectiveness of gloves using the biodynamic responses of the bare- and gloved-hand-arm system exposed to vibration. The laboratory experiments were performed with five human subjects using a typical anti-vibration air bladder glove subjected to a broad-band random vibration spectrum in conjunction with a specially designed instrumented handle. The measured data were analyzed to derive the biodynamic responses of the bare as well as gloved human hand-arm system in terms of the apparent mass and the mechanical impedance. The two biodynamic responses were applied to estimate the vibration isolation effectiveness of the glove. The validity of the proposed concept was examined by comparing the estimated vibration transmissibility magnitudes of the glove with those obtained using a palm adapter method. The comparison of the results suggests that the proposed method offers a good alternative for estimating glove vibration transmissibility. The measured data and the proposed method based upon the biodynamic responses were further used to investigate the effect of the palm adapter on the vibration transmissibility of the glove. The results suggest that the presence of the palm

adapter between the subject's palm and the glove may not alter the basic trends in the transmissibility response, but it would affect the transmissibility magnitudes in the middle- and high-frequency ranges. A distinct advantage of the proposed method is that it eliminates the use of an adapter in assessing the vibration isolation effectiveness of the gloves.[165]

The hand-tool coupling force in the operation of a vibrating tool is generally composed of applied force (AF) and biodynamic force (BF). There is interest in quantifying the coupling force. The objectives of this study are to develop an effective method for estimating the BF and to investigate its fundamental characteristics. The results indicate that the BFs depend on both the tool vibration spectrum and the biodynamic properties of the hand-arm system. The dominant BF frequency component is usually at the same frequency as the dominant vibration frequency of each tool.[166]

A vibration transfer function method for estimating the tool-specific performance of anti-vibration gloves was proposed to help select appropriate gloves for particular tools and to assess the potential risks posed by tool vibration. A PPT Program study evaluated the validity of the method by comparing the predicted vibration transmissibility with the measured value. Two typical vibration-attenuating gloves (air-bladder and visco-elastic material gloves) were used in the study. Two series of experiments were performed for the evaluation. In the first series, the isolation efficiency of selected anti-vibration gloves was evaluated in the laboratory under synthesized handle vibration spectra of six different tools. The second series of tests involved the measurement of the glove transmissibility while operating two different pneumatic chipping hammers. The results of the study showed agreements between the predicted and measured acceleration transmissibility values of the candidate gloves, thus the transfer function method provided a good estimate of vibration attenuation performance of gloves for specific tools.[167]

Output and Transfer Highlights

Systematic studies have created several new concepts and methodologies for studying HTV exposure and health effects, generated new knowledge of the biodynamics of the system, proposed new frequency weighting for exposure quantification, developed new anti-vibration glove test methods and medical test devices, enhanced understanding of the disorders and diagnostic methods, proposed alternative tool tests, and improved vibration and force measurement methods. This program has led to many conference presentations, one article in a trade journal, and more than 40 peer-reviewed journal papers. Our instrumented handle developed from this program has been marketed as a commercial product. NIOSH researchers have helped develop another commercial product: a novel 3-D HTV test system. Our automation nail press test has been patented. The knowledge generated from this program has directly influenced the revisions and/or developments of several international standards. The knowledge has also been used to provide consulting service and health hazard evaluation (HHE) for workplaces.[147]

Intermediate Outcomes

The results of NIOSH studies have been used to help the developments/revisions of ISO standards. Specifically, ISO/FDIS-15230 (2006) on hand force measurements includes three

NIOSH studies. A preliminary revision of ISO 10819 (1996) on glove test includes four NIOSH studies. NIOSH researchers are also taking a leading role in revising ISO 10068 (1998) [168] on biodynamic response, which is associated with another standard (ISO 13753, 1999) [169] on glove material test.

What's Next?

Several important issues and problems in the biodynamic measurement have been identified and resolved, which has significantly helped improve the reliability and accuracy of the experimental data. The results reported in recent years suggest that, from the point of view of biodynamics, the frequency weighting specified in ISO 5349-1 (2001) overestimates the low frequency effect but underestimates the high frequency effect on the ringers and hand. It is anticipated that the further studies of the biodynamics of the system will eventually lead to establishment of a robust vibration exposure theory.[170]

The glove test method specified in ISO 10819 (1996) is based on the measurement of the vibration transmitted to the palm of the hand. The isolation effectiveness of the glove for the fingers could be dramatically different from that for the palm. Further studies plan to develop an effective method to assess the effectiveness of the glove for finger protection. Alternative methods for protecting the fingers and hand will be explored.

Appendix D.7 List of Outputs

Peer Reviewed Publications

Bernard B, Nelson N, Estill CF, Fine L [1998]. Editorial response: The NIOSH review of hand-arm vibration syndrome: Vigilance is crucial. J Occup Environ Med. *40*(9):780 785.[171]

Dong RG, McDowell TW, Welcome DE, Rakheja S, Caporali SA, Schopper AW [2002]. Effectiveness of a transfer function method for evaluating vibration isolation performance of gloves when used with chipping hammers. Journal of Low Frequency Noise, Vibration, and Active Control. *21*(3):141 156.[158]

Dong RG, Rakheja S, Smutz WP, Schopper A, Welcome D, Wu JZ [2002]. Effectiveness of a new method (TEAT) to assess vibration transmissibility of gloves. Int J Ind Ergon. *30*(1):33 48.[157]

Dong RG, Rakheja S, Smutz WP, Schopper AW, Caporali SA [2003]. Dynamic characterization of instrumented handle and palm-adapter used for assessment of vibration transmissibility of gloves. J Test Eval. *31*(3):234 246. [160]

Dong RG, Welcome DE, McDowell TW, Rakheja S [2005]. Estimation of the transmissibility of anti-vibration gloves when used with specific tools. Noise Vib Worldw. *36*(9):11 20.[167]

Dong RG, McDowell TW, Welcome D, Barkley J, Warren C, Washington B [2004]. Effects of hand-tool coupling conditions on the isolation effectiveness of air bladder anti-vibrations gloves. J Low Freq Noise, Vib Active Control. *23*(4):231 248.[163]

Dong RG, McDowell TW, Welcome DE, Smutz WP [2005]. Correlations between biodynamic characteristics of human hand-arm system and the isolation effectiveness of anti-vibration gloves. Int J Ind Ergon. *35*(3):205 216.[164]

Dong RG, Rakheja S, McDowell TW, Welcome DE, Wu JZ, Warren C, Barkley J, Washington B, Schopper AW [2005]. A method for assessing the effectiveness of anti-vibration gloves using biodynamic responses of the hand-arm system. J Sound Vib *282*(3-5):1101 1118.[165]

Dong RG, Welcome DE, Wu JZ [2005]. Estimation of biodynamic forces distributed on the fingers and the palm exposed to vibration. Ind Health. *43*(3):485 494.[166]

Dong RG, Wu JZ, Welcome DE [2005]. Recent advances in biodynamics of human hand-arm system. Ind Health. *43*(3):449 471.[170]

NIOSH [1990]. Notice to Readers: Availability of NIOSH criteria document on hand-arm vibration syndrome. MMWR. May 18, 1990 *39*(19):327.[172]

Rakheja S, Dong R, Welcome D, Schopper AW [2002]. Estimation of tool-specific isolation performance of antivibration gloves. Int J Ind Ergon. *30*(2):71 87.[159]

Smutz WP, Dong RG, Han B, Schopper AW, Welcome DE, Kashon ML [2002]. A method for reducing adaptor misalignment when testing gloves using ISO 10819. Ann Occup Hyg. *46*(3):309 315.[156]

Conference Papers

Dong-RG; Smutz-WP; Rakheja-S; Schopper-AW; Welcome-D; Wu-JZ [2001]. Alternate methods for assessment of vibration attenuation performance of gloves. 9th International Conference on Hand-Arm Vibration, June 5-8, 2001, Nancy, France. Paris, France: Institut National de Recherche et de Securite (INRS), Jun:1-2.[152]

Dong RG, Rakheja S, Smutz PW, Schopper AW, Caporali SA, Stone S, Bader J [2001]. Dynamic characteristics of the instrumented handle and adapter recommended in the ISO 10819, 1996. 9th International Conference on Hand-Arm Vibration, June 5-8, 2001, Nancy, France. Paris, France: Institut National de Recherche et de Securite (INRS), Jun:1-2.[155]

Dong RG, McDowell TW, Welcome DE, Rakheja S, Smutz WP, Warren C, Wu JZ, Schopper AW [2003]. Effectiveness of anti-vibration gloves. Working Partnerships: Applying Research to Practice, NORA Symposium 2003, Washington, DC: NIOSH, Jun:45.[161]

Dong R, Wu J, Welcome D, Brumfield A, McDowell T, Wirth O, Krajnak K [2006]. HELD's hand-transmitted vibration program - from R&D to practice. NORA Symposium 2006: Research Makes a Difference! April 18-26, 2006, Washington, DC. Washington, DC: National Institute for Occupational Safety and Health, Apr:330-331.[147]

McDowell TW, Dong RG, Welcome DE [2004]. A pilot study of glove effects on a force matching method. 10th International Conference on Hand-Arm-Vibration, June 2004, Las Vegas, Nevada. Jun:83-84.[148]

NIOSH Reports

NIOSH [1983]. Current Intelligence Bulletin #38 "Vibration Syndrome", DHHS (NIOSH) 83 110.[173]

NIOSH [1989]. Criteria for a recommended standard: occupational exposure to hand-arm vibration. DHHS (NIOSH) 89 106.[174]

References

1. U.S. Environmental Protection Agency, *CFR Title 40, subchapter G, 211, subpart B- Hearing Protective Devices, U.S. EPA*. 2004.

2. U.S. Environmental Protection Agency, *Noise in America: the extent of the noise problem.* , in *EPA Report No. 550/9-81-101*. 1981, U.S. Environmental Protection Agency: Washington DC.

3. US Department of Labor. *Comparison of Production Workers, Not Seasonally Adjusted, before and after the March 2004 Benchmark.* [cited 2005 Sept 7]; Available from: ftp://ftp/bls.gov/pub/suppl/empsit.comppwu.txt.

4. ANSI, *American National Standard Method for the Measurement of Real-ear Protection of Hearing Protectors and Physical Attenuation of Earmuffs.*, in *S3.19-1974*. 1974, American National Standards Institute: New York.

5. Royster, J., et al., *Development of a new standard laboratory protocol for estimating the field attenuation of hearing protection devices. Part I. Research of Working Group 11, Accredited Standards Committee S12.* Noise. J Acoust Soc Am, 1996. **99**: p. 1506-1526.

6. Murphy, W., J. Franks, and E. Krieg, *Hearing protector attenuation: Models of attenuation distributions.* J Acoust Soc Am 2002. **111**(5 Part1): p. 2109-2116.

7. Murphy, W., et al., *Development of a new standard laboratory protocol for estimation of the field attenuation of hearing protection devices: Sample size necessary to provide acceptable reproducibility.* J Acoust Soc Am, 2004. **115**(1): p. 311-323.

8. Royster, L., *In Search of a Meaningful measure of Hearing protector Effectiveness.* Spectrum, 1995. **12**(201): p. 6-13.

9. Berger, E. and J. Franks, *The validity of predicting the field attenuation of hearing protectors from laboratory subject-fit data*. J Acoust Soc Am, 1996. **100**(4.2): p. 2674.

10. U.S. Environmental Protection Agency, *Workshop on Hearing Protector Devices, March 27-28*, in *Docket OAR-2003-0024*. 2003: Washington DC.

11. Berger, E., et al., *Development of a new standard laboratory protocol for estimating the field attenuation of hearing protection devices. Part III The validity of using subject-fit data.* J Acoust Soc Am, 1998. **103**(2): p. 665-672.

12. MSHA, *30 CFR parts 56, 57, and 62, health standards for occupational noise exposure; final rule*. 1999, Dept of Labor, Mine Safety and Health Administration.

13. ANSI, *American National Standards Institute: Methods for Measuring the Real-ear Attenuation of Hearing Protectors*, in *S12.6-1984*. 1984, American National Standards Institute: New York.

14. ANSI, *American national standard: Methods for measuring the real-ear attenuation of hearing protectors*, in *S12.6-1997 (R2002)*. 2002, American National Standards Institute, Inc: New York.

15. Franks, J., W. Murphy, and S. Simon, *Repeatability and reproducibility in hearing protector testing.* J Acoust Soc Am, 1996. **99**(3.2): p. 2464.

16. International Organization for Standardization, *Acoustics - Hearing Protectors - Part 1: Subjective method for the measurement of sound attenuation*, in *Reference No. ISO 4869-1*. 1990, ISO: Geneva.

17. International Organization for Standardization, *Acoustics - Hearing Protectors - Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn*, in *Reference No. ISO 4869-2*. 1990, ISO: Geneva.

18. International Standards Organization, *Acoustics - Hearing Protectors - Part 5: Method for estimation of noise reduction using fitting by inexperienced test subjects*, in *Reference No. ISO/TS 4869-3:2007*. 2006, International Standards Organization: Geneva.

19. International Standards Organization, *Acoustics - Hearing protectors - Part 3: Measurement of insertion loss of ear-muff type protectors using an acoustic test fixture*, in *Reference No. ISO 4869-3:2007*. 2007, International Standards Organization: Geneva.

20. Gauger, D. and E. Berger, *A new hearing protector rating: The noise reduction statistic for use with A-weighting.* NRSA, 2004.

21. ANSI, *S12.68-2007. American National Standards Institute: Methods of Estimating Effective A-weighted Sound Pressure Levels When Hearing Protectors are Qorn*. 2007, American National Standards Institute: New York.

22. Franks, J., et al. *NIOSH Hearing Protector Device Compendium*. http://www2a.cdc.gov/hp-devices/hp_srchpg01.asp 2003 [cited 2007 Aug 7].

23. Berger, E. and J. Franks, *The validity of predicting the field attenuation of hearing protectors from laboratory subject-fit data*. J Acoust Soc Am, 1996. **100**(4 Pt 2): p. 2674.

24. Franks, J., et al., *Four earplugs in search of a rating system.* Ear & Hearing, 2000. **21**(218-226).

25. Franks, J., C. Themann, and C. Sherris, *The NIOSH Compendium of Hearing Protection Devices*, in *DHHS (NIOSH) Publication No. 95-105, http://0-www.cdc.gov.mill1.sjlibrary.org/niosh/topics/noise/hpcomp.html*. 1995, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

26. Davis, R., W. Murphy, and D. Byrne, *A Longitudinal Study of Hearing Protection in Highly Experienced Earplug Users*, in *USPHS Professional Conference, June 4-7*. 2007: Cincinnati, OH

27. Gauger, D., et al., *Results of an Interlaboratory Study Comparing Method A and B Test Data*, in *National Hearing Conservation Association, Feb 16-17*. 2007: Savannah, GA.

28. Murphy, W., et al., *Results from the NIOSH/EPA Interlaboratory comparison of ANSI S12.6-1997 Methods A and B*, in *Acoustical Society of America Meeting, Dec. 3-6*. 2006: Honolulu, Hawaii.

29. Murphy, W., X. Zhu, and J.Y. Kim, *Study of the effect of hearing protectors for military noises based on time-frequency analysis by analytic wavelet transform*, in *Proceedings of Inter-Noise 2006, Dec 3-6*. 2006: Honolulu, Hawaii.

30. Franks, J., R. Davis, and W. Murphy, *Field Measurement of Hearing Protection Device Performance*, in *Proceedings of Inter-noise 2005, Aug 7-10*. 2005: Rio de Janeiro, Brazil

31. Murphy, W., et al., *Psychophysical uncertainty estimates for real ear attenuation at threshold measurements in naïve subjects*, in *Proceedings of NOISE-CON 2005, Oct 17-19*. 2005: Minneapolis, MN

32. Murphy, W., *Derivation of an analytic expression for the error associated with the Noise Reduction Rating*, in *Meeting of Acoustical Society of America, May*. 2005: Vancouver, BC.

33. Murphy, W., *Current Research Issues for Hearing Protectors*, in *Allied Construction Safety Days Conference, March 8*. 2005: Loveland, OH.

34. Murphy, W. and P. Shaw, *Calculation of the Intrinsic Error in Hearing Protector Ratings*, in *National Hearing Conservation Association, Feb 21*. 2005: Seattle, WA

35. Murphy, W., J. Franks, and P. Shaw, *Estimating the Precision in Hearing Protectors Ratings*, in *Acoustical Society of America, May*. 2004: New York, NY.

36. Murphy, W. and J. Franks, *Current status of standards for testing electroacoustic hearing protectors.* J. Acoust. Soc. Am, 2002. **112**(5 Pt. 2): p. 2317.

37. Murphy, W. and J. Franks, *A reevaluation of the Noise Reduction Rating*, in *Commissioned Officers Association of the US Public Health, Service, May 29*. 2001: Washington, DC.

38. Franks, J. and W. Murphy, *Now what do we do with these good numbers?* J Acoust Soc Am, 2000. **108**(5 Pt. 2): p. 2620.

39. Murphy, W. and J. Franks, *Progress on a rating system for hearing protector attenuation.* J Acoust Soc Am, 1999. **106**(4 Pt. 2): p. 2262.

40. Murphy, W. and J. Franks, *Reducing hearing protector test time with a minimum audible pressure to field transfer function.* J Acoust Soc Am, 1999. **106**(4 Pt. 2): p. 2238.

41. Murphy, W., et al., *Four protectors in search of a rating system.* J. Acoust. Soc. Am, 1999. **105**(2 Pt. 2): p. 1132.

42. Murphy, W. and J. Franks, *A Rating System in Search of Protectors.* J. Acoust. Soc. Am, 1999. **105**(2 Pt. 2): p. 1131.

43. Murphy, W. and J. Franks, *Analysis of repeatability and reproducibility of hearing protector real-ear-attenuation-at-threshold measured with three fitting methods*, in *Military Audiology Short Course, February 23-26*. 1998: Albuquerque, NM.

44. Murphy, W. and J. Franks, *Analysis of repeatability and reproducibility of hearing protector real-ear-attenuation-at-threshold measured with three fitting methods*, in *National Hearing Conservation Association, February 19-21*. 1998: Albuquerque, NM.

45. Murphy, W., et al., *Differences between binaural sound-field thresholds and monaural audiometric thresholds.* J Acoust Soc Am, 1997. **101**(5 Pt. 2): p. 3126.

46. NIOSH, *A Real-Ear Field Method for the Measurement of the Noise Attenuation of Insert-Type Hearing Protectors*, in *HEW (NIOSH) Publication No. 76-181*. 1976, U.S. Department of Health,, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health: Cincinnati, OH.

47. Fleming, R., *A new procedure for field testing of earplugs for occupational noise reduction [Dissertation]*, in *School of Public Health*. 1980, Harvard University: Cambridge, MA.

48. Michael, K., *Comprehensive use of hearing protectors: Integration of training, field monitoring, communication and documentation.* Journal of Occupational Hearing Loss, 1998. **1**: p. 67-74.

49. NIOSH, *Criteria for a Recommended Standard Occupational Noise Exposure: Revised Criteria 1998*, in *DHHS (NIOSH) Publication No. 98-126*. 1998, U.S. Department of Health and Human Services, Public

Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

50. Murphy, W., et al., *EPHB Survey Report 312-11a* in *Advanced Hearing Protector Study: Conducted at General Motors Metal Fabrication Division Flint Metal Center, Flint Michigan*. 2006, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health

51. Murphy, W. and J. Franks, *Software development for NIOSH hearing protector testing.* J Acoust Soc Am, 2002. **112**(5.2): p. 2295.

52. Murphy, W., et al., *NIOSH Health Hazard Evaluation Report* in *HETA #2004-0095 GM Flint Metal Fabrication Division, Flint, Michigan*. 2005, U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health (Submitted for internal peer-review Sept. 1, 2005).

53. Murphy, W., J. Franks, and R. Davis, *Field measurements of Hearing Protection Device Performance.* InterNoise, 2005(Rio de Janerio, Brazil, August 6).

54. Murphy, W. and J. Franks, *A statistical classifer for hearing protector REAT data.* J Acoust Soc Am, 2000. **108**(5.2): p. 2621.

55. Franks, J., et al., *Alternative field methods for measuring hearing protector performance.* Am Ind Hyg Assoc J, 2003. **64**(4): p. 501-509.

56. Joseph, A., et al., *The Effects of training format on earplug performance.* Accepted for publication to Int. J. Aud, 2007.

57. Franks, J., W. Murphy, and A. Suter, *United States Environmental Protection Agency, Workshop on Hearing Protector Devices*, in *Papers and Proceedings*. 2003: Washington, DC.

58. Franks, J., *State of the Art: New testing methods and passive hearing protectors*, in *Proceedings of Noise Induced Hearing Loss Basic mech., prev. & cont.* 2001.

59. Franks, J. and E. Berger, *Personal protection: Hearing protection*, in *Encyclopedia of Occup. Health and Safety, (4th ed., p. 31.11-31.15)* Stellman J, Editor. 1998: Geneva Switzerland: Int. Labor Office.

60. Berger, E., J. Franks, and F. Lindgren, *International review of field studies of hearing protector attenuation*, in *Scientific Basis of Noise-Induced Hearing Loss*, A. Axelsson, H. Borchgrevink, and R. Hamernik, Editors. 1996, Thieme Medical Pub Inc: New York. p. 361-377.

61. Franks, J., et al., *Alternative field methods of measuring hearing protector performance*, in *Abstracts of the Midwinter Meeting of the Association for Research in Otolaryngology*. 1999. p. 22.

62. Murphy, W., *Evaluation of a Real-World Hearing Protector Fit-Test System*, in *National Hearing Conservation Association, February 18*. 2000: Denver, CO

63. Murphy, W. and J. Franks, *Evaluation of a FitCheck hearing protector test system.* J Acoust Soc Am, 1999. **106**(4 Pt. 2): p. 2263.

64. Franks, J., W. Murphy, and S. Simon, *Repeatability and reproducibility in hearing protector testing.* J. Acoust. Soc. Am, 1996(99): p. 2464.

65. Bureau of Justice Statistics. *Law Enforcement Statistics: Summary Findings*. http://www.ojp.usdoj.gov/bjs/lawenf.htm U.S. Department of Justice, Washington, DC 2005 [cited 2005 Nov 10].

66. Clark, W., *Noise exposure from leisure activities: A review*. J Acoust Soc Am, 1991. **90**: p. 175-181.

67. Henderson, D. and R. Hamernick, *Impulse noise: critical review*. J Acoust Soc Am, 1986. **80**(2): p. 569-584.

68. Occupational Safety and Health Administration, *OSHA Directive No. CPL 2-2.35A-29 CFR 1910.95 (b)(1)*, in *Guidelines for noise enforcement; Appendix A (Dec 19, 1983)*. 1983, U.S. Department of Labor, Occupational Safety and Health Administration: Washington, DC.

69. Tubbs, R., W. Murphy, and M. Little, *Health Hazard Evaluation Report 2002-0131-2898*, in *Fort Collins Police Services, Fort Collins, Colorado*. 2002, National Institute for Occupational Safety and Health: Cincinnati, Ohio.

70. Harney, J., et al., *Health Hazard Evaluation Report 2000-0191-2960*, in *Immigration and Naturalization Service, National Firearms Unit, Altoona, Pennsylvania*. 2005, National Institute for Occupational Safety and Health: Cincinnati, Ohio.

71. Murphy, W. and R. Tubbs, *Assessment of Noise Exposure for an Indoor and Outdoor Firing Range.* Journal of Occupational and Environmental Hygiene, 2007. **4**: p. 688-697.

72. Murphy, W., D. Byrne, and J. Franks, *Firearms and Hearing Protection.* Hearing Review, 2007(March): p. 36, 38.

73. Kardous, C., J. Franks, and R. Davis, *NIOSH/NHCA Best practices workshop on impulsive noise.* Noise Control Engineering Journal, 2005. **53**(2): p. 53-60.

74. Kardous, C. and D. Chrislip. *NIOSH Safety and Health Topic: Indoor Firing Ranges*. http://www.cdc.gov/niosh/topics/ranges/ 2005 [cited 2005 Dec 1].

75. Kardous, C., et al., *Noise Exposure Assessment and Abatement Strategies at an Indoor firing range.* Appl. Occup. Env. Hyg, 2003. **18**: p. 629-636.

76. Kardous, C., R. Willson, and W. Murphy, *Noise Dosimeter for Monitoring Exposure to Impulse Noise.* Applied Acoustics Journal, 2005. **66**: p. 974-985.

77. Kardous, C., *NIOSH Alert occupational hazards for indoor firing ranges*, in *press*. 2007, DHHS-CDC-NIOSH.

78. Murphy, W., *Deriving a new NRR from ANSI S12.6B method, inter-laboratory reproducibility of data and precision of the data*, in *U.S. Environmental Protection Agency Workshop on Hearing Protector Devices, March 27 – 28*. 2003: Washington, DC.

79. Kardous, C. and W. Murphy, *New System for monitoring exposure to impulsive noise*, in *Proceedings of Inter-noise 2005, Aug 7-10*. 2005: Rio de Janeiro, Brazil

80. Murphy, W., et al., *Auditory Risk of Hearing Loss due to Gunshot Noise Exposure*, in *National Hearing Conservation Association, Feb 16-17*. 2007: Savannah, GA

81. Kardous, C. and W. Murphy, *Noise Abatement for Indoor Firing Ranges*, in *USPHS Professional Conference, June 4-7*. 2007: Cincinnati, OH

82. Murphy, W., *Evaluation of level-dependent hearing protection devices for use with impulse noises*, in *American Industrial Hygiene Conference & Expo (AIHce), May 13-18*. 2006: Chicago, Illinois.

83. Murphy, W., J. Franks, and A. Behar, *Hearing protector labeling for active noise reduction devices*, in *Acoustical Society of America, November 18*. 2004: San Diego, CA.

84. Murphy, W., *Evaluation of Level-dependent Hearing Protection Devices for Use with Impulsive Noises*, in *American Industrial Hygiene Conference 2004 Noise Symposium, May 9*. 2004: Atlanta, GA

85. Murphy, W., *Evaluation of Level-dependent Hearing Protection Devices for Use with Impulsive Noises*, in *American Industrial Hygiene Conference 2004 Noise Symposium, Feb 21*. 2004: Seattle, WA.

86. Murphy, W., *Peak reductions of nonlinear hearing protection devices*, in *National Hearing Conservation Association/NIOSH Best Practices Workshop on Impulse Noise, April 7-8*. 2003: Cincinnati, OH

87. Murphy, W. and C. Kardous, *Attenuation measurements of linear and nonlinear hearing protectors for impulse noise.* J. Acoust. Soc. Am, 2003. **113**(4 Pt. 2): p. 2195.

88. Kardous, C., W. Murphy, and R. Willson, *Personal noise exposure assessment from small firearms.* J. Acoust. Soc. Am, 2003. **113**(4 Pt. 2): p. 2195.

89. Franks, J. and W. Murphy, *Do sound restoration hearing protectors provide adequate attenuation for gunfire noise.* J. Acoust. Soc. Am, 2002. **112**(5 Pt. 2): p. 2294.

90. Murphy, W. and M. Little, *Performance of Electroacoustic Hearing Protectors.* J. Acoust. Soc. Am, 2002. **111**(Pt. 5): p. 2336.

91. Suter, A., *The effects of hearing protectors on speech communication and the perception of warning signals*, in *Report for Department of Defense, United States Army*. 1989, Environmental Health Agency: Washington, DC.

92. Cameron, H., *Audio Mechanical Transducer Communication System*, in *NIOSH Grant R43 OH02313*. 1988: Cincinnati, Ohio.

93. Kardous, C., *Eartalk - Hearing Protector and Communication System in Prasher P., Luxon L., Pyykko I. (eds.).* Advances in Noise Research, 1998. **II** (Protection Against Noise, Whurr Publishers, London).

94. Gwin, K., et al., *Hazard evaluation and technical assistance report: Human Performance International, Inc., Charlotte, North Carolina*, in *NIOSH Report No. HETA 00-0110-2849*. 2001, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health: Cincinnati, OH.

95. Stephenson, M. and C. Merry, *Hearing Protection for Miners*, in *DHHS (NIOSH) Publication No. 98-151*. 1998, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

96. Kardous, C., *EarTalk: Protector and Microphone.* The Military Engineer, 2003. **621**: p. 43-44.

97. Morata, T., et al., *Factors affecting the use of hearing protectors in a population of printing workers.* Noise and Health, 2001. **3**(13): p. 25-32.

98. Kardous, C., *EARTALK - Hearing Protector and Communication System*, in *Paper and poster presentation at the Second Pan European Conference on Protection against Noise, June 16-19*. 1997: London, England.

99. Franks, J., D. Dunn, and C. Sizemore, *Ear Based Hearing Protector/Communication System*, in *U.S. Patent # 5,426,719*. 1995, U.S. Patent and Trademark Office: Washington, DC.

100. National Center for Health Statistics, *Prevalence and Characteristics of Persons With Hearing Trouble; United States, 1990-91*, in *Vital and Health Statistics, series 10, No. 188 DHHS Publication No. (PHS) 94-1516*. 1994.

101. National Institute for Occupational Safety and Health (NIOSH), *Analysis of audiograms for a large cohort of noise-exposed metal/nonmetal miners. Franks, JR*, in *pp. 1-7, and cover letter to Davitt McAteer from Linda Rosenstock, Aug 6, .* 1996.

102. National Institute for Occupational Safety and Health (NIOSH), *Analysis of audiograms for a large cohort of noise-exposed miners. Franks, JR*, in *pp. 1-5, and cover letter to Andrea Hricko from Gregory Wagner, Oct 7,*. 1997.

103. Stephenson, M. *New approaches for preventing hearing loss among carpenters*. in *Abstracts of the Sixth Annual Carpenters Health and Safety Conference, March 24-28*. 1996. Palm Springs, CA.

104. Simpson, T., M.H. Stewart, and B. Blakley, *Audiometric referral criteria for industrial hearing conservation programs.* Arch Otolaryngol Head Neck Surg, 1995. **121**(4): p. 407-11.

105. Stephenson, M. and C. Merry, *Hearing loss among coal miners and measures to protect hearing.* Holmes Safety Association Bulletin, 1998(October): p. 3-5.

106. Grayson, L., *Effective prevention of hearing loss in miners.* Holmes Safety Association Bulletin, 1999(January): p. 3-5.

107. Rosler, G., *Progression of hearing loss caused by occupational noise.* Scand Audiol, 1994. **23**(1): p. 13-37.

108. Ward, W., J. Royster, and L. Royster, *Auditory and nonauditory effects of noise. Berger EH, Royster LH, Royster JD, Driscoll DP, & Layne M (eds.).* The Noise Manual Fifth Edition: American Industrial Hygiene Association, Fairfax, VA, 2000: p. 123-147.

109. Abel, S., P. Alberti, and K. Riko, *Speech intelligibility in noise with hearing protectors.* J Otolaryngology, 1980. **9**(3): p. 256-265.

110. Suter, A., *The effects of hearing protectors on speech communication and the perception of warning signals*, in *Technical Memorandum 2-89*. 1989, US Army Human Engineering Laboratory: Aberdeen Proving Ground, Maryland.

111. Abel, S. and D. Spencer, *Active noise reduction versus conventional hearing protection: Relative benefits for normal hearing and impaired listeners.* Scand Audiol, 1997. **26**(3): p. 155-167.

112. Abel, S., et al., *Signal detection in industrial noise: Effects of noise exposure history, hearing loss, and the use of ear protection.* Scand Audiol, 1985. **14**: p. 161-173.

113. Abel, S. and V. Hay, *Sound localization - The interaction of aging, hearing loss and hearing protection.* Scand Audiol, 1996. **25**(1): p. 3-12.

114. Zwerling, C., et al., *Occupational injuries among workers with disabilities - the National Health Interview Survey, 1985-1994.* JAMA, 1997. **278**(24): p. 2163-2166.

115. Abel, S., S. Armstrong, and C. Giguere, *Auditory-perception with level dependent hearing protectors. The effects of age and hearing loss.* Scand Audiol, 1993. **22**(2): p. 71-85.

116. NIOSH, *Proposed National Strategies for the Prevention of Leading Work-Related Diseases and Injuries Part 2*, in *Assoc Schools of Public Health, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.* 1988.

117. Verbsky, B., *Effects of conventional passive earmuffs, uniformly attenuating passive earmuffs, and hearing aids on speech intelligibility in noise. Doctoral Dissertation.* 2002, The Ohio State University.

118. Verbsky, B., *Accommodation of Noise-Exposed, Hearing-Impaired Workers: Phase III/IV - Field Implementation of Questionnaire and Evaluation Strategy*, in *NIOSH Human Subject Review Board, HSRB 03-DART-06XP*. 2003.

119. Verbsky, B., *Accommodation of Noise-Exposed, Hearing-Impaired Workers.*, in *OMB Clearance 0920-040Z granted November 15*. 2004.

120. Morata, T., et al., *Attitudes and beliefs about hearing loss prevention among workers with self-reported hearing difficulties.* Ear & Hearing, 2006(in press).

121. Randolph, R., *Working Impaired in Dangerous Settings: What the What the Workers Tell Us*, in *Platform presentation at the National Hearing Conservation Association annual conference*. 2004.

122. Verbsky, B., *Accommodation of Noise-Exposed, Hearing-Impaired Workers.*, in *Research Podium presentation, Annual Convention of the American Academy of Audiology*. 2004.

123. Verbsky, B., *Hearing Aids + Earmuffs: Safe & Effective Within Limits*, in *Poster presented at the National Hearing Conservation Association annual conference*. 2003.

124. Verbsky, B. and L. Feth, *Hearing Conservation: Hearing Protection versus Speech Intelligibility and Personal Safety*, in *Poster presentation at the 2002 meeting of the American Auditory Society*. 2002.

125. BLS, *Incidence rates for nonfatal occupational injuries and illnesses involving days away from work per 10,000 full-time workers by industry and selected events or exposures leading to injury or illness, 2002*, in *http://www.bls.gov/iif/oshwc/case/ostb1275.txt*. 2004.

126. Ellis, N., *Introduction to Fall Protection, 2nd ed.* American Society of Safety Engineers, 1994(Des Plaines, IL): p. 142-147.

127. BLS. *BLS Releases 2000-2010 Employment Projections.* ftp://ftp.bls.gov/pub/news.release/History/ecopro.12032001.news 2001 [cited 2004 March 26].

128. Cotman, J., W. Chang, and T. Courtney, *A Retrospective Study of Occupational Slips, Trips, and Falls Across Industries*, in *Proceedings of the 44th Annual International Ergonomics Association/Human Factors Ergonomics Society Congress Vol 4*. 2000: San Diego, CA. p. 473-476.

129. Hsiao, H., J. Whitestone, and T. Kau, *Evaluation of Fall-Arrest Harness Sizing Scheme.* Human Factors 48, 2006(in press).

130. Simeonov, P., et al., *Footwear effects on walking balance at elevation.* Ergonomics, 2006(submitted).

131. Hsiao, H., B. Bradtmiller, and J. Whitestone, *Sizing and Fit of Fall-Protection Harnesses.* Ergonomics, 2003. **46**(12): p. 1233-1258.

132. Hsiao, H., D. Long, and K. Snyder, *Anthropometric Differences among Occupational Groups.* Ergonomics, 2002. **45**(2): p. 136-152.

133. Turner, N.L., et al., *Suspension tolerance in men and women wearing safety harnesses*, in *The American Industrial Hygiene Conference and Exposition, (Abstract No. 144)*. 2006: Chicago, IL.

134. Hsiao, H., *Falls Prevention (keynote speech), Slip, Trip, and Fall Symposium*, in *Ergonomics Society annual conference*. 2005: UK.

135. Hsiao, H., et al., *Constructing New Harness Fit Charts using 3D Anthropometric Information*, in *Contemporary Ergonomics 3:7, April 4 – 7*. 2005: Hertfordshire, England.

136. Pan, C., et al., *Incidents Due to Aerial Work Platforms*, in *Proceedings of XVIIth World Congress on Safety and Health at Work*. 2005: Orlando, FL.

137. Friess, M., F. Rohlf, and H. Hsiao, *Quantitative assessment of human body shape using Fourier analysis*, in *proceedings of SPIE—The International Society for Optical Engineering Conference, January 18-22*. 2004: San Jose, California.

138. Hsiao, H., *Anthropometric Procedures for Design Decisions: From Flat Map to 3D Scanning*, in *Contemporary Ergonomics, proceedings of the Ergonomics Society Conference in April*. 2004, CRC Press: Boca Raton, FL. p. 144-148.

139. Lineberry, G., et al., *An educational intervention for extension ladder set-up and use*, in *Power Through Partnerships: 12th Annual Construction Safety and Health Conference, Proceedings May 21-23*. 2002: Rosemont, IL.

140. Ramani, R., et al., *Hazard recognition: fall prevention in construction*, in *Best Practices in Occupational Safety and Health, Education, Training, and Communication: Ideas That Sizzle, 6th International Conference, Scientific Committee on Education and Training in Occupational Health, ICOH, In Cooperation with The International Communication Network, ICOH, October 28-30*. 2002: Baltimore, Maryland.

141. Simeonov, P., et al., *Comparing standing balance at real and virtual elevated environments*, in *Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting 2002, Sep-Oct*. 2002. p. 2169-2173.

142. Hsiao, H. and B. Dotson, *Safe work at elevation through virtual reality simulation*, in *NOIRS 2000--Abstracts of the National Occupational Injury Research Symposium 2000, October 17-19*. 2000, National Institute for Occupational Safety and Health Pittsburgh, PA. p. 60-61.

143. Pan, C. and S. Chiou, *Slip and fall: fall protection in construction safety*, in *Industrial and Occupational Ergonomics: Users' Encyclopedia, Apr: CDROM (1-9)*. 1999, International Journal of Industrial Engineering: Cincinnati, OH.

144. Casini, V. and T. Lentz, *NIOSH - a resource for occupational health and safety support, October, http://www.natehome.com/98/tt1098.html*. Tower Times, 1998. **4**(10): p. 35-37.

145. Bradtmiller, B., et al., *Improving Fall Protection Harness Safety: Contributions of 3-D Scanning*, in *Scanning 2000—Numerisation 3D, 5th ed. Proceedings of the Industrial Congress on 3D Digitizing, Paris, France, May 24-25*. 2000, Harbour: Cedex, France. p. 117-128.

146. Centers for Disease Control and Prevention (CDC), *A provisional patent application was filed on July 14, 2006 for a harness accessory which automatically supports a wearer in a sitting position with the knees elevated at a position at or above the hips after a fall (CDC Ref. No. I-002-06)*. 2006.

147. Dong, R., et al., *HELD's hand-transmitted vibration program - from R&D to practice. NORA Symposium 2006: Research Makes a Difference! April 18-26, 2006, Washington, DC.* National Institute for Occupational Safety and Health, 2006(Apr): p. 330-331.

148. McDowell, T., R. Dong, and D. Welcome, *A pilot study of glove effects on a force matching method*, in *10th International Conference on Hand-Arm-Vibration, June*. 2004: Las Vegas, Nevada. p. 83-84.

149. Chase Ergonomics Co. *GELFOM: Vibration Reducing Gloves*. http://chaseergo.com/CHASEERG/PRODUCT/49449.htm 2007 [cited 2007 Aug].

150. ANSI, *S3.40: Guide for the measurement and evaluation of gloves which are used to reduce exposure to vibration transmitted to the hand*. 1989, American National Standards Institute: New York.

151. ISO, *10819: Mechanical vibration and shock - Hand-arm vibration - Method for the measurement and evaluation of the vibration transmissibility of gloves at the palm of the hand*. 1996, International Organization for Standardization: Geneva, Switzerland.

152. Dong, R., et al., *Alternate methods for assessment of vibration attenuation performance of gloves*, in *9th International Confernece on Hand-Arm Vibration, June 5-8, 2001*. 2001, Institut National de Recherche et de Securite (INRS): Nancy, France. Paris, France. p. 1-2.

153. ISO, *5349-1: Mechanical vibration - measurement and evluation of human exposure to hand-transmitted vibration - part 1: General requirements*. 2001, International Organization for Standardization: Geneva, Switzerland.

154. ISO, *15230/FDIS: Mechanical vibration and shock - Coupling forces at the man-machine interface for hand-transmitted vibration*. 2007, International Organization for Standardization: Geneva, Switzerland.

155. Dong, R., et al., *Dynamic characteristics of the instrumental handle and adapter recommended in the ISO 10819, 1996*, in *9th International Conference on Hand-Arm Vibration, June 5-8, 2001*. 2001, Institut National de Recherche et de Securite (INRS): Nancy, France. Paris, France. p. 1-2.

156. Smutz, W., et al., *A method for reducing adaptor misalignment when testing gloves using ISO 10819.* Ann Occup Hyg, 2002. **46**(3): p. 309-315.

157. Dong, R., et al., *Effectiveness of a New Method (TEAT) to Assess Vibration Transmissibility of Gloves.* Int J Ind Ergon, 2002. **30**(1): p. 33-48.

158. Dong, R., et al., *Effectiveness of a transfer function method for evaluating vibration isolation performance of gloves when used with chipping hammers.* Journal of Low Frequency Noise, Vibration, and Active Control, 2002. **21**(3): p. 141-156.

159. Rakheja, S., et al., *Estimation of tool-specific isolation performance of antivibration gloves.* Int J Ind Ergon, 2002. **30**(2): p. 71-87.

160. Dong, R., et al., *Dynamic characterization of instrumented handle and palm-adapter used for assessment of vibration transmissibility of gloves.* J Test Eval, 2003. **31**(3): p. 234-246.

161. Dong, R., et al., *Effectiveness of anti-vibration gloves*, in *Working Partnerships: Applying Research to Practice, NORA Symposium, June*. 2003, NIOSH: Washington, DC. p. 45.

162. Dong, R., et al., *On-the-hand measurement methods for assessing effectiveness of anti-vibration gloves.* Int J Ind Ergon, 2003. **32**(4): p. 283-298.

163. Dong, R., et al., *Effects of hand-tool coupling conditions on the isolation effectiveness of air bladder anti-vibration gloves.* J Low Freq Noise, Vib Active Control, 2004. **23**(4): p. 231-248.

164. Dong, R., et al., *Correlations between biodynamic characteristics of human hand-arm system and the isolation effectiveness of anti-vibration golves.* Int J Ind Ergon, 2005. **35**(3): p. 205-216.

165. Dong, R., et al., *A method for assessing the effectiveness of anti-vibration gloves using biodynamic responses of the hand-arm system.* J Sound Vib, 2005. **282**(3-5): p. 1101-1118.

166. Dong, R., D. Welcome, and J. Wu, *Estimation of biodynamic forces dictributed on the fingers and the palm exposed to vibration.* Ind health, 2005. **43**(3): p. 485-494.

167. Dong, R., et al., *Estimation of the transmissibility of anti-vibration gloves when used with specific tools.* Noise Vib Worldw, 2005. **36**(9): p. 11-20.

168. ISO, *10068: Mechanical vibration - measurement and evaluation of human exposure to hand-transmitted vibration - part 1*. 1998, International Organization for Standardization: Geneva, Switzerland.

169. ISO, *13753: Mechanical vibration and shock - hand-arm vibration - method for measuring the vibration transmissibility of resilient materials when loaded by the hand-arm system*. 1999, International Organization for Standarization: Geneva, Switzerland.

170. Dong, R., J. Wu, and D. Welcome, *Recent advances in biodynamics of human hand-arm system.* Ind Health, 2005. **43**(3): p. 449-471.

171. Bernard, B., et al., *Editorial Response: The NIOSH Review of Hand-Arm Vibration Syndrome: Vigilance Is Crucial.* J Occup Environ Med, 1998. **40**(9): p. 780-785.

172. NIOSH, *Notice to Readers: Availability of NIOSH Criteria Document on Hand-Arm Vibration Syndrome.* MMWR - Morbidity & Mortality Weekly Report, May 18, 1990. **39**(19): p. 327.

173. NIOSH, *Current Intelligence Bulletin #38 "Vibration Syndrome"*, in *DHHS (NIOSH) 83-110*. 1983.

174. NIOSH, *Criteria for a recommended standard: occupational exposure to hand-arm vibration*, in *DHHS (NIOSH) 89-106*. 1989.

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Appendix E Back to the AppendicesTable of Contents

List of PPT Program Stakeholders

Appendix E is a listing of selected significant stakeholders to the PPT Program. An appropriate internet web site is identified for each stakeholder. The entities included in this appendix are grouped into seven classifications of stakeholders:

(1) Academia,
(2) Government,
(3) Industry,
(4) International,
(5) Labor,
(6) Non-governmental Organizations
(7) Professional and Trade Associations.

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List of PPT Stakeholders

Disclaimer: The following links in this section go to web sites outside of CDC/NOSH and should not be considered as an official endorsement of their content, or as a statement of NIOSH policy.

Academia

Stakeholders	Website/Link
Boston University	External Link: http://www.bu.edu/
Carnegie Mellon University (CMU)	External Link: http://www.cmu.edu/
Department of Public Health, University of California, Berkeley	External Link: http://sph.berkeley.edu/resources/cphp.html
National Academy of Public Administration (NAPA)	External Link: http://www.napawash.org/
North Carolina State University (NCSU)	External Link: http://www.ncsu.edu/
Ohio State University (OSU)	External Link: http://www.osu.edu/
Penn State University (PSU)	External Link: http://www.psu.edu/
Software Engineering Institute - Carnegie Mellon University (SEI)	External Link: http://www.sei.cmu.edu/
University of California at Davis (UCD)	External Link: http://www.ucdmc.ucdavis.edu/
University of Arizona	External Link: http://www.arizona.edu/
University of Cincinnati	External Link: http://www.uc.edu/
University of Idaho	External Link: http://www.uihome.uidaho.edu/uihome/
University of Minnesota	External Link: http://www.med.umn.edu/
University of Pittsburgh	External Link: http://www.pitt.edu/
University of Pittsburgh, Center for Emergency Medicine (CEM)	External Link: http://emergencymedicine.health.pitt.edu/content.asp?id=473
University of Pittsburgh Medical Center (UPMC)	External Link: http://www.upmc.com/
Virginia Polytechnic Institute (VPI)	External Link: http://www.vt.edu/
Washington University in St. Louis	External Link: http://www.washu.edu/
Washington University (School of Medicine) in St. Louis	External Link: http://medschool.wustl.edu/
West Virginia University (WVU)	External Link: http://www.wvu.edu/

Government

Stakeholders	Website/Link
Bureau of Labor Statistics (BLS)	External Link: http://www.bls.gov/
Department of Homeland Security (DHS)	External Link: http://www.dhs.gov/index.shtm
Department of Energy (DOE)	External Link: http://www.energy.gov/
Emerging Infectious Diseases (EID)	http://www.cdc.gov/ncidod/EID/
Environmental Protection Agency (EPA)	External Link: http://www.epa.gov/
Federal Highway Administration (FHWA)	External Link: http://www.fhwa.dot.gov/
Food and Drug Administration (FDA)	External Link: http://www.fda.gov/
Fort Collins Police Department	External Link: http://www.ci.fort-collins.co.us/police/
Lawrence Livermore National Laboratory (LLNL)	External Link: http://www.llnl.gov/
Louisiana Department of Health and Hospitals (LDHH), Office of Public Health	External Link: http://www.dhh.louisiana.gov/offices/?ID=249
Mine Safety and Health Administration (MSHA)	External Link: http://www.msha.gov/

National Highway Traffic Safety Administration EMS Division (NHTSA)	External Link: Home | National Highway Traffic Safety Administration(NHTSA) | U.S. Department of Transportation
National Institute for Occupational Safety and Health (NIOSH)	http://www.cdc.gov/niosh/
Division of Respiratory Disease Studies (DRDS)	http://mtn.niosh.cdc.gov/drds/
Division of Safety Research (DSR)	http://mtn.niosh.cdc.gov/dsr/
Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS)	http://dshefs.niosh.cdc.gov/
National Personal Protective Technology Laboratory (NPPTL)	http://pit.niosh.cdc.gov/npptl/
Pittsburgh Research Laboratory (PRL)	http://pit.niosh.cdc.gov/prl/default.htm
Spokane Research Laboratory (SRL)	http://spo.niosh.cdc.gov/mn_srl.html
National Institute of Standards and Technology (NIST)	External Link: http://www.nist.gov/
Office of Personnel Management (OPM) Center for Talent Services	External Link: http://www.opm.gov/products_and_services/
Occupational Safety & Health Administration (OSHA)	External Link: http://www.osha.gov/
Pacific Northwest National Laboratory (PNNL)	External Link: http://www.pnl.gov/
Phoenix Fire Department	External Link: http://phoenix.gov/FIRE/index.html
Pittsburgh - Allegheny County Fire Academy (ACFA)	External Link: http://www.alleghenycounty.us/emerserv/fireacad/index.aspx
Pittsburgh Fire Bureau	External Link: http://www.city.pittsburgh.pa.us/fire/
RDECOM (U.S. Army Research, Development and Engineering Command)	External Link: http://www.rdecom.army.mil/
Technical Support Working Group (TSWG)	External Link: http://www.tswg.gov/tswg/home/home.htm
U.S. Air Force	External Link: http://www.af.mil/
U.S. Army Aeromedical Research Laboratory (USAARL)	External Link: http://www.usaarl.army.mil/
U.S. Fire Administration	External Link: http://www.usfa.dhs.gov/
U.S. Navy	External Link: http://www.navy.mil/
U.S. Veterans Health Administration (VHA)	External Link: http://www.va.gov/
Washington State Department of Transportation (WA-DOT)	External Link: http://www.wsdot.wa.gov/

Industry

Stakeholders	Website/Link
3M	External Link: http://www.3m.com/
Aearo Company	External Link: http://www.aearo.com/
Afferent Corporation	External Link: http://www.afferentcorp.com/Afferent/Default.aspx
Air Techniques International	External Link: http://www.atitest.com/
Alpha Protech	External Link: http://www.alphaprotech.com/
Ambulance Manufacturers (National Truck Equipment Association – NTEA)	External Link: http://www.ntea.com/mr/divisions/amd/intro.asp

American Allsafe (Jackson Safety)	External Link: http://www.americanallsafe.com/
American Medical Response (AMR)	External Link: http://www.amr.net/
Anthro Tech	External Link: http://www.anthrotech.com/
ArcOne	External Link: http://www.arc1weldsafe.com/autodarkeningfilters.htm
Aspen Systems, Inc	External Link: http://www.aspensystems.com/
Avon	External Link: http://www.avon-rubber.com/default.htm
Badger Mining Corporation (BMC)	External Link: http://www.badgerminingcorp.com/
Battelle	External Link: http://www.battelle.org/
Biomarine, Inc	External Link: http://www.biomarineinc.com/
BJC Health Care	External Link: http://www.bjc.org/
Bullard Company	External Link: http://www.bullard.com/
Cairns Protective Clothing	External Link: http://www.cairnsclothing.com/
Cintas Corporation	External Link: http://www.cintas-corp.com/
Crosstex International	External Link: http://www.crosstex.com/
CSE Corporation	External Link: http://www.csecorporation.com/
Designer-III Company	External Link: http://www.bpaddock.com/
Donaldson	External Link: http://www.donaldson.com/en/index.html
doseBusters USA	External Link: http://www.dosebusters.com/
Dräger Corporation	External Link: http://www.draeger.com/ST/internet/US/en/index.jsp
DuPont Nanoparticle OSH Committee	External Link: http://www2.dupont.com/DuPont_Home/en_US/
EG&G	External Link: http://www.urscorp.com/EGG_Division/index.php
Fire-EYE (Firefighter's Temperature Encoder)	External Link: http://fire.me.berkeley.edu/fireeye.html
Firefighter Boot manufacturers – AirBoss	External Link: http://www.airbossofamerica.com/
Gempler	External Link: http://www.gemplers.com/
General Motors (GM)	External Link: http://www.gm.com/
Gentex Corporation	External Link: http://www.gentex.com/
Hogy Medical Co., Ltd	External Link: http://www.hogy.co.jp/index-e.html
Howard Leight	External Link: http://www.howardleight.com/default.asp
Howard Leight Industries – Bilsom	External Link: http://www.hearingportal.com/
ICS Laboratories Inc.	External Link: http://www.icslabs.com/
ILC Dover	External Link: http://www.ilcdover.com/
INOVA Health Systems	External Link: http://www.inova.org/inovapublic.srt/index.jsp
Inovel, LLC	External Link: http://www.inovelmedical.com/
International Safety Instruments	External Link: http://www.ishn.com/
Interspiro, USA	External Link: http://www.interspiro-us.com/
International Safety Equipment Association (ISEA)	External Link: http://www.safetyequipment.org/
ISEA Hand Protection Group	External Link: http://www.safetyequipment.org/glovestd.htm
Jinfuyu Industrial Co., Ltd (JFY)	External Link: http://www.jfymasks.com.tw/
Johnson & Johnson	External Link: http://www.jnj.com/home.htm
Kimberly-Clark Corporation	External Link: http://www.kchealthcare.com/global/index.asp
Liberty Gloves and Safety	External Link: http://www.libertyglove.com/
Liberty Mutual Research Institute for Safety	External Link: http://www.libertymutual.com/omapps/ContentServer?pagename=ResearchCenter/Page/StandardOrange&cid=1029415781973
Louis M. Gerson Company	External Link: http://www.gersonco.com/
Magid Glove and Safety	External Link: http://www.magidglove.com/
Makrite Industries, Inc	External Link: http://www.makrite.com.tw/
Medline Industries, Inc	External Link: http://www.medline.com/
Mercer Tools Corporation (Tools Plus)	External Link: http://www.tools-plus.com/
Moldex-Metric, Inc	External Link: http://www.moldex.com/
Molnlycke Healthcare	External Link: http://www.allegromedical.com/
Morning Pride	External Link: http://www.morningpride.com/
Mine Safety Appliances Company (MSA)	External Link: http://www.msanet.com/
Nelson-Jameson, Inc.	External Link: http://www.nelsonjameson.com/

North Safety Products	External Link: http://www.northsafety.com/
Ocenco	External Link: http://www.ocenco.com/
Optimetrics, Inc.	External Link: http://www.omi.com/
ORC Worlwide	External Link: http://www.orc-dc.com/
Parkwood Consulting (Mining)	External Link: http://www.parkwood-consulting.com/ourpeople.html
Peltor	External Link: http://www.peltor.se/int/default.asp
Pyramex Safety Products	External Link: http://www.pyramexsafety.com/
Respiratory Systems, Inc	External Link: http://www.lifeair.com/
Respirex, International Ltd	External Link: http://www.respirex.co.uk/
RoxCoal, Inc	External Link: http://goliath.ecnext.com/coms2/product-compint-0001164670-page.html
Safety Equipment Co., Inc (Major Safety)	External Link: http://www.majorsafety.com/
Safety Harness Manufacturers – U. S. Safety Equipment	External Link: http://www.ussafetyequipment.com/
Safety Harness Manufacturers – B2B Manufactures.com	External Link: http://www.manufacturers.com.tw/security/Safety-Harness.html
Safety Requirements Inc.	External Link: http://www.safetyrequirements.com/index.html
Safety Tech International, Inc	External Link: http://www.safetytechint.com/
Safety Zone, LLC	External Link: http://www.safety-zone.com/
Scott Health and Safety (TYCO)	External Link: http://www.scotthealthsafety.com/
Sellstrom	External Link: http://www.sellstrom.com/
SKC, Inc.	External Link: http://www.skcinc.com/
Survivair	External Link: http://www.survivair.com/
Tenajon Resources Corp. (TJS Mining)	External Link: http://www.tenajon.com/
Thermo Electron Corp. (Thermo Scientific)	External Link: http://www.thermo.com/
TJS Mining	External Link: http://www.dep.state.pa.us/dep/deputate/minres/dms/website/stats_insp/coallist.htm#tjs
Triosyn Corporation (Safe Life)	External Link: http://www.triosyn.com/
Unimin Corporation	External Link: http://www.unimin.com/
U.S. Safety	External Link: http://www.ussafety.com/
Willson ® Dalloz Safety Products (Bacou-Dalloz)	External Link: http://www.bacou-dalloz.com/index.asp

International

Stakeholders	Website/Link
Australian Coal Association Research Program (ACARP QLD, AU)	External Link: http://www.acarp.com.au/index1024.shtml
Coal Services, NSW, AU	External Link: http://www.coalservices.com.au/
Finnish Institute of Occupational Health	External Link: http://www.ttl.fi/internet/english/
Howie Associates, Inc., UK	External Link: http://www.rhassoc.co.uk/index.htm
International Organization for Standardization (ISO)	External Link: http://www.iso.org/iso/en/ISOOnline.frontpage
National Information Standards Organization (NISO)	External Link: http://www.niso.org/international/index.html
San Huei United Company, Ltd	External Link: http://www.sanhuei.com/
Sunwell Dynamics Resources Corp. Taipei, Taiwan, R.O.C.	External Link: http://www.allproducts.com/
Suzuken Co., Ltd., of Nagoya, Aichi, Japan	External Link: http://www.suzuken.co.jp/english/index.html

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List of PPT Stakeholders

Labor

Stakeholders	Website/Link
InterAgency Board (IAB)	External Link: http://www.iab.gov/download/sel2000.htm
International Association of Fire Chiefs (IAFC)	External Link: http://www.iafc.org/
International Association of Fire Fighters (IAFF)	External Link: http://www.iaff.org/
Industrial Minerals Association of North America (IMA-NA)	External Link: http://www.ima-na.org/
International Personnel Protection, Inc. (IPP)	External Link: http://www.astm.org/consultants/cdirect/000978.htm
Laborer's International Union of North America (LIUNA)	External Link: http://www.liuna.org/
National Association of State Fire Marshals	External Link: http://www.firemarshals.org/
National Demolition Association	External Link: http://www.demolitionassociation.com/
National Mining Association (MNA)	External Link: http://www.nma.org/
National Volunteer Fire Council (NVFC)	External Link: http://www.nvfc.org/
National Wildfire Coordinating Group (NWCG)	External Link: http://www.nwcg.gov/
The International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)	External Link: http://www.uaw.org/
United Mine Workers of America (UMWA)	External Link: http://www.umwa.org/homepage.shtml
United Steel Workers Union (USW)	External Link: http://www.uswa.org/uswa/program/content/index.php

Non-governmental Organizations

Stakeholders	Website/Link
Advisory Council for the Elimination of Tuberculosis (ACET)	External Link: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4809a1.htm
American College of Occupational and Environmental Medicine (ACOEM)	External Link: http://www.acoem.org/
American National Standards Institute (ANSI)	External Link: http://www.ansi.org/
ANSI Z87.1 Standard Committee (Revised American National Standard for Occupational and Educational Eye and Face Protection Devices)	External Link: http://www.safetyequipment.org/eyeface.htm
American Society for Testing and Materials (ASTM)	External Link: http://www.astm.org/cgi-bin/SoftCart.exe/index.shtml?E+mystore
National Academies	External Link: http://www.nationalacademies.org/
National Fire Protection Association (NFPA)	External Link: http://www.nfpa.org/index.asp?cookie%5Ftest=1
Society for Healthcare Epidemiology in America (SHEA)	External Link: http://www.shea-online.org/
Society for Protective Coatings (SSPC)	External Link: http://www.sspc.org/
Underwriters Laboratories (UL)	External Link: http://www.ul.com/

Professional and Trade Associations

Stakeholders	Website/Link
American Road and Transportation Builders Association (ARTBA)	External Link: http://www.artba.org/
The American Chemistry Council	External Link: http://www.americanchemistry.com/s_acc/index.asp
The American Petroleum Institute (API)	External Link: http://api-ep.api.org/
The National Paint and Coatings Association	External Link: http://www.paint.org/
The Synthetic Organic Chemical Manufacturers Association (SOCMA)	External Link: http://www.socma.com/
U.S. Fire Departments	External Link: http://home.flash.net/~jturner/map.htm

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Appendix F Back to the AppendicesTable of Contents

List of PPT Program Partners

Appendix F identifies selected individuals who have been identified as significant PPT Program partners. Each partner's name, affiliation (e.g. employer, professional organization, trade association, etc.) and the type of partner represented by their affiliation (e.g. government, Labor, manufacturer of PPE, academia, industrial user of PPE, etc.) to define the relationship between the partner and the PPT Program. Contact information including telephone number, email and mailing address are also provided for each partner.

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List of PPT Partners

Partner type	Exp	Affiliation	Name	Phone	E-mail	Address
Academia	D	North Carolina State University	Barker, Dr. Roger L.	919-515-6577	Roger_barker@ncsu.edu	North Carolina State University College of Textiles 2401 Research Drive, Box 8301 Raleigh, NC 27695-8301
Academia	I/R	University of Minnesota School of Public Health Division of Environmental and Occupational Health Associate Professor	Brousseau, Lisa, ScD, CIH	Phone: 612-624-3143 Fax: 612-626-4837	brosseau@umn.edu	Box 807 Mayo 420 Delaware St. SE Dept M Minneapolis MN 55455-0381
Academia	I/R	University of Arizona Division of Community, Environment and Policy	Burgess, Dr. Jeffery	520-626-4918	jburgess@u.arizona.edu jburgess@email.arizona.edu	Mel and Enid Zuckermand College of Public Health University of Arizona 1435 N. Fremont Ave Tucson, AZ 85719-4116
Academia	H	Virginia Tech Industrial and Systems Engineering	Casali, John G.	Work: 540-231-5073 Local: 540-552-6449	jcasali@vt.edu	Work: Industrial & Systems Engr 519G Whittemore Hall Blacksburg, VA 24061 Local: 2800 Wellesley Court Blacksburg, VA 24060
Academia	I/R	University of New Haven Chair, Occupational Safety and Health Dept.	Cohen, Howard, PhD., CIH	Tel: 203-932-7238 Fax: 203-931-6054	hcohen@newhaven.edu	University of New Haven 300 Boston Post Rd. West Haven, CT 06516-1916
Academia	D I/R	Royal Military College of Canada Adj. Associate Professor Department of Chemistry & Chemical Engineering & Assistant Professor, Continuing Studies	Dickson, Eva G., Dr.	613-541-6000 ext. 6217 Fax: 613-542-9489	dickson-e@rmc.ca	Royal Military College of Canada PO Box 17000 Stn Forces Kingston, ON K7K 7B4
Academia	I/R	University of Maryland College Park Professor Fischell Department of Bioengineering Room 2237 Jeong H. Kim Engineering Building (Bldg. #225)	Johnson, Arthur T.	Tel: 301-405-1184 Fax: 301-405-9953	artjohnson@mail.umd.edu	University of Maryland College Park, MD 20742
Academia	I/R TI	West Virginia University College of Engineering and Mineral Resources Professor and Associate Dean, Industrial and Management Systems Engineering	Myers, Warren R.	Tel: 304-293-4821 x2210 Fax: 304-293-4970	warren.myers@mail.wvu.edu	College of Engineering and Mineral Resources P.O. Box 6070 Morgantown, WV 26506-6070

EXP = Expertise: I/R = Inhalation/Respiratory, D = Dermal, H = Hearing, TI = Traumatic Injury

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Partner type	Exp	Affiliation	Name	Phone	E-mail	Address
Academia	TI	University of Washington Environmental Health and Safety Industrial Hygienist 2	Herzmark, Jay, RN, CIH	206-221-3354 206-543-7388 FAX: 206-543-3351	herzmark@u.washington.edu	University of Washington Environmental Health and Safety 29 Hall Health Center Box 354400 Seattle, WA 98195-4400
Certification Organization	D I/R	Safety Equipment Institute (SEI)	Gleason, Patricia A.	703-442-5732	pgleason@seinet.org	1307 Dolley Madison Blvd Suite 3A McLean, VA 22101
Consultant	D I/R	Terrorism Research Center Responder Knowledge Base	Hewitt, Don O.	703-790-7212	Hewitt@terrorism.com	5765-F Burke Centre Parkway PMB-331 Burke, VA 22015
Consultant	D I/R TI	ASTM International Chairman of ASTM F23 Protective Clothing & Equipment Committee - Chairman President International Personnel Protection, Inc.	Stull, Jeffrey	Tel: 512-288-8272 (Bus.) Fax: 512-344-9588 Cell: 512-658-0808 (Mobile)	intlperpro@aol.com	International Personnel Protection, Inc. P.O. Box 92493 Austin, Tx 78739-TX 78709-2493 Shipping Address: International Personnel Protection, Inc. 7809 Addelaide Drive Austin, TX 78739-1409
Distributor	I/R D H TI	Premier Safety Oakdale Office Industrial Division President & CEO Safety Equipment Distributor	Varadi, Keith	800-828-1080 x 501 Fax: 724-693-8698 Cell: 412-736-5785	premier@premiersafety.net k.varadi@premiersafety.net	Premier Safety Two Industrial Park Drive Oakdale, PA 15071
Emergency Responder	D I/R	InterAgency Board (IAB) Executive Chairman	Ingram, Chief Robert J.	212-360-4482	bobliny@aol.com	Fire Department New York Hazmat Operations Brooklyn Navy Yard Bldg 292, 2nd Floor Brooklyn, NY 11205
Govt Agency Canadian Govt	TI	Certification Authority Securite-ingenierie IRSST Directeur	Boileau, Paul-Emile., PhD	Tel: 514-288-1551	boileau.paul-emile@irsst.qc.ca www.irsst.qc.ca	505 De Masionneuve Ouest Montreal, Qc H3A 3C2
Govt Agency	D I/R	Army Research Physiologist	Caretti, Dave	Tel: 410-436-6699 Fax: 410-436-3141	david.caretti@us.army.mil	U.S. Army Edgewood CB Center ATTN: AMSSB-RRT-PR E5604 5183 Blackhawk Road Aberdeen Proving Ground, MD 21010-5424
Govt Agency	D I/R	Department for Homeland Security – DHS Director, Office of Standards	Coursey, Dr. Bert M.	202-772-9536 202-254-5811	Bert.coursey@dhs.gov	245 Murray lane Building 410 Washington, DC 20528-0001

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Govt Agency	D I/R	U. S. Fire Administration	Dickinson, Charlie Deputy Director	301-447-1080	Charlie.dickinson@dhs.gov	
Govt Agency	D I/R	Occupational Safety and Health Administration (OSHA) / Director Directorate of Standard and Guidance	Dougherty, Dorothy	Tel: 202-693-1950	dougherty.dorothy@dol.gov	
Govt Agency	D I/R H TI	Occupational Safety and Health Administration (OSHA) / Director Directorate of Enforcement Programs (DEP)	Fairfax, Richard		Fairfax.Richard@dol.gov	
Govt Agency	D I/R H TI	MSHA	Kravitz, Jeff	Tel: 412-386-6923 Fax: 412-386-6964	kravitz.jeffery@dol.gov	Mine Safety and Health Administration 626 Cochrans Mill Road P.O. Box 18233 Pittsburgh, PA 15236
Govt Agency Japanese Govt	I/R	Certification Authority Chief of Research Laboratory	Matsumura, Yoshimi., Dr.		matsumura@ankyo.org.jp	
Govt Agency	D I/R H	Occupational Safety and Health Administration (OSHA) / Director Directorate of Science, Technology and Medicine	McCully, Ruth	Tel: 202-693-2300 Fax: 202-693-1644	ruth.mccully@osha.gov McCully.Ruth@dol.gov	U.S. Department of Labor 200 Constitution Ave., NW Washington, DC 20210
Govt Agency	I/R	FDA Food and Drug Administration Branch Chief, Infection Control Devices Branch Division of Anesthesiology, General Hospital, Infection Control, and Dental Devices	Murphey, Shelia A., MD	Tel: 240-276-3747 Fax: 240-276-3789	shelia.murphey@fda.hhs.gov	Office of Device Evaluation CDRH, FDA 9200 Corporate Blvd Rm 350AA MS HFZ-480 Rockville, MD 20850
Govt Agency Marine Corps Department of Defense	D I/R	USMC, CBIRF	Pitts, Sam	301-744-2029	pittssc@cbirf.usmc.mil	CBIRF, Bld 901 101 Strauss Ave Indian head, MD 20640
Govt Agency Research & Development	D I/R	Technical Support Working Groups – TSWG CBRNE Countermeasures Subgroup	Ramos, Gabe	703-602-6203	ramosg@tswg.gov	1111 Jefferson David Highway Suite 116 Arlington, VA 22202
Govt Agency US Navy PPE User	D I/R	Navy Environmental Health Center Industrial Hygienist	Spelce, David L., MS, CIH	Tel: 757-953-0719 DSN: 377-0719 Fax: 757-953-0689	spelced@nehc.med.navy.mil	Requisition Technical Support Dept 620 John Paul Jones Circle, Ste 1100 Portsmouth, VA 23708-2103

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Partner type	Exp	Affiliation	Name	Phone	E-mail	Address
Govt Agency		Mine Safety and Health Administration (MSHA) Assistant Secretary of Labor	Stickler, Richard E.	Tel: 202-693-9400 Fax: 202-693-9401	zzMSHA-asmsha@dol.gov	Mine Safety and Health Administration (MSHA) 1100 Wilson Boulevard, 21st Floor Arlington, VA 22209-3939
Govt Agency Vietnamese Govt	I/R	Researcher	Thuc, Nguyen Quoc	Day: 844-8214946 Night: 844-6363271 Cell: 0912061312	nqthuc2002@yahoo.com nqhoa19@yahoo.com	18 Yec Xanh -Hai Ba Hanoi, Vietnam
Govt Agency Chile	D I/R TI	ISP Jefe Depto. de Salud Ocupacional y Contaminación Ambiental	Parra, Manuel		mparra@ispch.cl	Instituto de Salud Pública de Chile Av. Marathon 1000- Ñuñoa Santiago, Chile
Industry	I/R	Bituminous Coal Operators' Association	Lamonica, Joe	Tel: 202-783-3195 Home: 803-644-8967	jlll@bellsouth.net	Bituminous Coal Operators' Association 1500 K Street, NW Suite 875 Washington, DC 20005
Industry	I/R	National Mining Association	Watzman, Bruce	202-463-2600		National Mining Association 101 Constitution Avenue, NW Suite 500 East Washington, DC 20001
Labor	I/R	United Mine Workers of America	O'Dell, Dennis	703-208-7200		United Mine Workers of America 8315 Lee Highway Fairfax, VA 22031
Manufacturers	I/R	Ocenco, Inc.	Droppleman, Pat	262-947-9000		Ocenco, Inc. LakeView Corporate Park 10225 82nd Avenue Pleasant Prairie, WI 53158
Manufacturers Full Range PPE	D I/R	North Safety Products President US Industrial Division	Ellis, Charles "Sid"	Tel: 401-943-4400 Direct: 401-275-2665 Fax: 401-946-6125 Cell: 401-255-6105 VM: 800-603-1645 x3665	sid.ellis@northsafety.com	200 Plainfield Pike Cranston, RI 02921
Manufacturers Protective Ensembles	D	Globe Manufacturing Company	Freese, Robert A.	603-435-8323	robf@globefiresuits.com	37 Loudon Road Pittsfield, NH 03263-0128

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Partner type	Exp	Affiliation	Name	Phone	E-mail	Address
Manufacturers	D	Total Fire Group Chief Operating Officer	Grilliot, Mary I.	Tel: 937-264-2662 Fax: 937-264-2677	info@totalfiregroup.com	Correspondence PO Box 13616 Dayton, OH 45413-0616 Shipping #1 Innovation Court Dayton, OH 45414-3967
Manufacturers Protective Ensembles	D	Morning Pride Manufacturing Total Fire Group	Grilliot, William	937-454-4925	Bg@morningpride.com	Correspondence PO Box 13616 Dayton, OH 45413-0616 Shipping #1 Innovation Court Dayton, OH 45414-3967
Manufacturers Personal Alert Safety Systems (PASS)	D I/R	Grace Industries, Inc.	Jarboe, John	410-286-2401	jjarboe@gracesales.com	645 Keith Lane Owings, MD 20736
Manufacturers	I/R	Draeger Safety	Kenneweg, Wes	412-787-3383		Draeger Safety 101 Technology Drive Pittsburgh, PA 15275
Manufacturers Full Range PPE	I/R	MSA Mine Safety Appliances Company President/CEO of MSA N. America	Lambert, William M.	Tel: 412-787-3383		MSA World Headquarters RIDC Park 121 Gamma Dr Pittsburgh, PA 15238-2919
Manufacturers	I/R	CSE Corporation Chief Executive Officer	Shearer, Scott B.	Tel: 412-856-9200 Fax: 412-856-9203 Cell: 412-916-4366	sbs@csecorporation.com	CSE Corporation 600 Seco Road Monroeville, PA 15146
Manufacturers Respirator & PASS	D I/R	Survivair Bacou-Dalloz, Inc.	Weinstein, Steven H.	714-427-5287	sweinstein@survivair.com	3001 South Susan Street Santa Ana, CA 92704
Manufacturers		TMC Company President	Taipalus, Theodore R.	Tel: 719-282-3383 Alt: 800-399-5698 Fax: 719-282-9048	TMCCompany@att.net	TMC Company 2665 Clapton Drive Colorado Springs, CO 80920
Manufacturers Respirator	I/R	Moldex-Metric, Inc. Vice President Technical Services	Birkner, Jeffrey S., MS, CIH	Tel: 310-837-6500 Tel: 800-421-0668x700 Fax: 310-837-2024	jeffreyb@moldex.com Alt: birkner@ix.netcom.com	Moldex-Metric, Inc 10111 Jefferson Blvd. Culver City, CA 90232-3509

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Partner type	Exp	Affiliation	Name	Phone	E-mail	Address
Manufacturers Respirator	I/R	Global Secure Holdings President & CEO	Brandes, Craig R.	Tel: 301-306-3470 Fax: 301-306-3479 Cell: 240-398-6986	cbandes@globalsecureholdings.com www.globalsecureholdings.com	8401 Corporate Dr. Suite 230 Landover, MD 20785
Manufacturers Respirator	I/R	Louis M. Gerson Company, Inc Quality Control Manager	Brunell, Robert	Tel: 508-947-4000 Fax: 508-947-5442	rbrunell@gersonco.com	Louis M. Gerson Company, Inc 15 Sproat Street Middleboro, MA 02346-2228
Manufacturers Respirator	I/R	Safety Tech International, Inc President and CEO	Kline, Dale	Tel: 301-624-5600 Alt: 888-744-6462 Fax: 301-624-5688 Cell: 301-693-3799	dkline@safetytechint.com	5703 Industry Lane Frederick, MD 21704
Manufacturers Respirator	I/R	The S.E.A. Group North America Safety Equipment America Inc.	Metzler, Richard W.	Tel: 724-746-2033 888-732-3500 Fax: 724-746-4421	richard.metzler@theseagroup.com rwmetzler@comcast.net	265 Meadowlands Blvd Washington, PA 15302-8902
Manufacturers Respirator	I/R	Scott (Tyco) Health & Safety	Phifer, Jerry	704-296-4560	jphifer@tycoint.com	309 West Crowell St. Monroe, NC 28111
Manufacturers Respirator	I/R	Neutronics Inc. President and Chief Operating Officer	Sosnowski, Joseph A.	Tel: 610-524-8800 Fax: 610-524-8807 Alt: 800-378-2287	joe.sossnowski@Neutronicsinc.com info@Neutronicsinc.com www.Neutronicsinc.com	456 Creamery Way Exton, PA 19341-2532
Manufacturers Respirator	I/R	Aearo Company	Tremblay, Julie	508-764-5784	Julie_tremblay@aearo.com	90 Mechanic Street Southbridge, MA 01550
Manufacturers Respirator	I/R	3M	Weber, Bob	Tel: 651-737-4459 Fax: 651-736-7344	robert.weber@mmm.com	3M Company 3M Center, Building 235-2E-91 St. Paul, MN 55144-1000
Manufacturers Respirator	D I/R	DuPont Personal Protection Senior Research Chemist	Young, Rich Ph.D			DuPont Personal Protection Spruance Plant 5401 Jefferson Davis Hwy Richmond, VA 23234-2257
PPE User	D I/R	Department of Veterans Affairs	Denny, Frank	202-273-9743	Frank.denny@va.gov	810 Vermont Ave NW Office of OSH(OOS) Washington, DC 20420
PPE User	D I/R	Exxon Mobil Corporation Industrial Hygiene Coordinator for Baytown & Latin America Manufacturing	Fleeger, Allan K. CIH, CSP	Tel: 281-834-3318 Fax: 281-834-5757 Pgr: 713-846-3685	allan.k.fleeger@exxonmobil.com	Exxon Mobil Corporation Medicine & Occupational Health 5000 Bayway Drive Baytown, TX 77520 P.O. Box 4004 Baytown, TX 77522-4004

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PPE User	D I/R	Inova Health System	Hanfling, Dan	703-776-3002	Dan.hanfling@inova.com	North Virginia Hospital Alliance Inova Health System 3300 Gallows Road Falls Church, VA 22042
PPE User	I/R	Dow Chemical Company Personal Safety Expertise Center	Seiler, Donald H. CIH, CSP	Tel: 989-636-3958 Fax: 989-638-7142	dseiler@dow.com	The Dow Chemical Company 1261 Building Midland, MI 48667
Professional Organization	D I/R H	ISEA International Technical Director	Comer-Bradley, Janice	Tel: 703-525-1695 Fax: 703-528-2148	jbradley@safetyequipment.org	International Safety Equipment Association-ISEA 1901 North Moore Street Ste 808 Arlington, VA 22209-1762
Professional Organization	D I/R	AIHA President and EHS Director for the Architectural & Functional Coatings and Adhesives & Sealants	Renshaw, Frank	Tel: 215-785-7306 Fax: 215-785-7553	FRenshaw@rohmhass.com	Rohm and Haas Company 3100 State Road Croydon, PA 19021
Professional Organization	D I/R H	ISEA International President	Shipp, Dan	Tel: 703-525-1695 Fax: 703-528-2148	dshipp@safetyequipment.org	International Safety Equipment Association-ISEA 1901 North Moore Street Ste 808 Arlington, VA 22209-1762
Professional Organization	D I/R TI H	NFPA Staff Liaison (NFPA)	Teele, Bruce	Tel: 508-984-7482 Fax: 508-984-7056	bteele@nfpa.org	National Fire Protection Association 1 Batterymarch Park Quincy, MA 02169-7471
Standards agency	I/R	ISO Production Group Manager-Air-Purifying Respirators Mine Safety Appliances Company	Bobetich, Kenneth V.	Tel: 412-967-3148 Fax: 412-967-3521	Ken.Bobetich@MSAnet.com	Mine Safety Appliances Company 121 Gamma Drive Pittsburgh, PA 15238-2919 or 1100 Cranberry Woods Drive Cranberry Township, PA 16066-5208
Standards agency	D I/R H	American National Standards Institute (ANSI) Program Manager, Procedures and Standards Administration NY	Thompson, James T.	Tel: 212-642-4913 Fax: 212-840-2298	info@ansi.org	American National Standards Institute (ANSI) 25 West 43rd Street, 4th Fl. New York, New York, 10036
Standards Development Organization – PPE Committee	D I/R	NFPA Emergency Medical Services Protective Clothing and Equipment Technical Committee – Chairman	Brehm, Chief Donna P.	757-385-8811	dbrehm@vbgov.com	Virginia Breach Fire Department Municipal center Building 21 Virginia Beach, VA 23456

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Standards Development Organization – PPE Committee	D I/R	NFPA Special Operations Protective Clothing & Equipment – Chairman	Cox, Chief Dean W.	703-280-0544	Dean.cox@fairfaxcounty.gov	Fairfax County Fire & Rescue 4100 Chain Bridge Road Fairfax, VA 22030
Standards Development Organization – PPE Committee	D I/R	NFPA Hazardous Materials Protective Clothing and Equipment – Chairman	Jirka, Chief Glenn P.	Tel: 937-433-4242x278 Fax: 937-438-2335 Cell: 937-608-0590	GJirka@miamitownship.com	Miami Township Fire & EMS Division 2700 Lyons Road Miamisburg, OH 45342-3790
Standards Development Organization – PPE Committee	D I/R	NFPA Structural and Proximity Fire Fighting Protective Clothing and Equipment – Chair	King, Chief (Ret.) Stephen J.	631-242-0621	tikitai@aol.com	29 Stevenson Place Deer Park , NY 11729
Standards Development Organization – PPE Committee	D I/R	NFPA Respiratory Protection Equipment – Chairman	Reed, Chief Ray F. (Retired)	Home: 214-969-6909	texasreeds@aol.com	
Standards Development Organization – PPE Committee	D I/R	NFPA Electronic Safety Equipment Technical Committee - Chairman	Varner, Chief Bruce	707-543-3531	bvarner@santarosafd.com	Santa Rosa Fire Department 955 Sonoma Avenue Santa Rosa, CA 95404
Standards Development Organization – PPE Committee	D I/R	ASTM International F23 Protective Clothing & Equipment Committee F23.30 – Chemical Subcommittee	Zeigler, Dr. James P.	804-383-2017	James.p.zeilger@usa.dupont.com	E.I. DuPont de Nemours and Company, Inc. PO Box 27001 Richmond, VA 23261
Test Lab	D I/R	ICS, Inc. Laboratories President	Pfriem, Dale B.	Tel: 330-220-0515 Fax: 330-220-0516	DPFRIEM@ICSLABS.COM	ICS, Inc. Laboratories 1072 Industrial Pkwy., North Brunswick, OH 44212
Union	I/R	AFSCME American Federation of State, County and Municipal Employees, AFL-CIO / Assistant Director Health & Safety	August, James	Tel: 202-429-1233 Fax: 202-223-3255	jaugust@afscme.org	AFSCME Department of Research and Collective Bargaining Services 1625 L Street, N.W. Washington, DC, 20036

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Partner type	Exp	Affiliation	Name	Phone	E-mail	Address
Union	I/R	International Union Of Operating Engineers International Environmental Technology and Training Center (Training Department Manager)	Bell, Patrick J.	Tel: 304-253-8674 Fax: 304-253-1384	pbell@iuoeiettc.org	1293 Airport Road Beaver, WV 25813
Union	I/R	AFL-CIO Health and Safety Director Services Employees International Union	Borwegen, Bill	Tel: 202-898-3385 Fax: 202-898-3403	BorwegeB@SEIU.org	AFL-CIO 1313 L Street NW Washington, DC 20005-4110
Union	D I/R TI	IAFF Assistant to the General President International Association of Fire Fighters (IAFF)	Duffy, Rich	Tel: 202-824-1571 Alt: 202-737-8484 Fax: 202-737-8414	rduffy@iaff.org	International Association of Fire Fighters (IAFF) 1750 New York Ave NW Ste 300 Washington, DC 20006-5395
Union	I/R	CPWR Assoc. Director/Toxicologist Center to Protect Workers' Rights	Platner, James W., Ph.D., CIH	Tel: 301-578-8500 x140 Fax: 301-578-8572	jplatner@cpwr.com	Center to Protect Workers' Rights 8484 Georgia Ave, Ste 1000 Silver Springs, MD 20910-5618
Union PPE User	I/R	ICWUC International Chemical Workers Union Council Director Health & Safety Department	Sprinker, Michael., CIH	Tel: 330-867-2444 Fax: 330-867-0544		1655 West Market Street Akron, OH 44313-7095

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List of PPT Collaborative Agreements (MOUs and IAs)

Appendix G lists the 18 Collaborative Agreements [8 Memorandums of Understanding (MOU) and 4 Interagency Agreements (IA) (receivable) and 6 IAs (payable)] through which other entities provide funding in support of partnerships with the PPT program

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List of PPT Collaborative Agreements (MOUs and IAs)

#	MOUs	Organization	Description	Start	End
1	MOU	American Society for Testing and Materials (ASTM)	To facilitate cooperation with NIOSH and ASTM Intl. involving the determination of performance requirements and cooperation in the development of test methods, product specifications, practices, guides, classifications, and terminology related to worker and emergency responder protective clothing and equipment.	2 Dec 2005	2 Dec 2010
2	MOU	E.I. DuPont De Nemours and Company (DuPont)	Facilitate cooperation between NIOSH and DuPont with respect to activities involving the evaluation of current product performance, test methods, and research gaps related to PPE used to reduce exposure to nanoparticles.	1 Apr 2006	31 Dec 2007
3	MOU	International Safety Equipment Association (ISEA)	Collaboration between NPPTL and the ISEA to work cooperatively to assess emergency responder access to NIOSH-approved chemical, biological, radiological, nuclear respiratory protective devices, CBRN personal protective equipment, weapons of mass destruction personal protective equipment and to provide unit sales data to NIOSH/NPPTL for fulfilling its reporting required to the US Congress.	1 Sep 2005	1 Sep 2010
4	MOU	National Fire Protection Association (NFPA)	Facilitate the partnering, cooperation, and coordination of activities between NIOSH/NPPTL and NFPA	31 Oct 2005	31 Oct 2010
5	MOU	Safety Equipment Institute (SEI)	To facilitate partnering, cooperation, and coordination of certification activities between NIOSH/NPPTL and SEI. Primary focus will be emergency responder protective clothing and equipment including PPE for response to all emergency incidents including fire, technical rescue, hazardous materials, emergency medical, special operations, and CBRNE hazards.	3 May 2006	Indefinite
6	MOU 058-02	U.S. Department of Energy (DOE)	To further the development of new technologies for protecting emergency responders from injury and death in chemical, biological, and radiological events.	21 Aug 2002	21 Aug 2007
7	MOU 02-060	U.S. Army Soldier and Biological Chemical Command – Natick Soldier Center, National Protection Center	To collaborate on the development of technologies for public safety purposes	1 May 2002	31 Dec 2005
8	MOU 42CFR84	Mine Safety and Health Administration, Labor and National Institute for Occupational Safety and Health, CDC, HHS.	The purpose of this MOU is to establish procedures to be followed by MSHA and NIOSH in exercising their respective responsibilities for joint approval of certain respirators under the provisions of 42 CFR Part 84. It also establishes guidelines for interaction between MSHA and NIOSH with respect to issues dealing with respirator certification and related matters. These issues include but are not limited to: certification, quality assurance, and field complaints.	10 Jul 1995	

NIOSH PPT Program Evidence Package Aug 30, 2007
List of PPT Collaborative Agreements (MOUs and IAs)

#	IAs Receivable	Organization	Description	Start	End
1	00-19 Mod- 6	National Institute for Standards and Technology (NIST)	Continued Development of Standards for Respiratory Protection Equipment	1 May 2000	31 Dec 2011
2	05-02 06Mod-1	Department of Navy (TSWG)	Next Generation Structural Fire Fighting PPE with Chemical/Biological Protection	30 Dec 2004	30 Sep 2007
2a	07-12	Department of Navy (TSWG)	Risk Based Protective Clothing Material Permeation Criteria	9 Feb 2007	9 Feb 2009
3	06-02	Department of Defense – Edgewood Chemical Biological Center (ECBC)	CDC/NIOSH Testing services	16 Aug 2006	16 Aug 2009
4	06-12	Department of Health and Human Services Office of Public Health Emergency Preparedness	Recommendations for Reusable N95 Respiratory and Surgical Masks- Influenza Pandemic	10 Feb 2006	30 Sep 2006

NIOSH PPT Program Evidence Package Aug 30, 2007
List of PPT Collaborative Agreements (MOUs and IAs)

#	IAs Payable	Organization	Description	Start	End
1	03-10	CASU – VA Financial Services	NIOSH Administrative Services	27 Dec 2002	31 Dec 2006
2	05-23	Defense Technical Information Center (DTIC)	Technical and Program Support for the Interagency Board (IAB) for Equipment Standardization and InterOperability (Battelle)	28 Jun 2005	28 Jun 2015
3	96-12	Oak Ridge Operations Office (ORISE)	ORISE Support to the Health Communications Branch (Mod 15)	1 Oct 2001	30 Sep 2007
4	05-35 Mod-2	Office of Personnel Management (OPM)	Provide Customer Satisfaction Surveys and Consulting for NPPTL	1 Aug 2005	30 Sep 2007
5	02-03 Mod-6	US Army Research, Development and Engineering Command (RDECOM)	Testing Activities to Support Respirator Standards Development and Approval Testing	15 Oct 2001	30 Sep 2009
6	02-24	Mine Safety and Health Administration (MSHA)	Development, Distribution and Evaluation of Self-Contained Self-Rescuer Training Modules	15 May 2002	30 Sep 2003

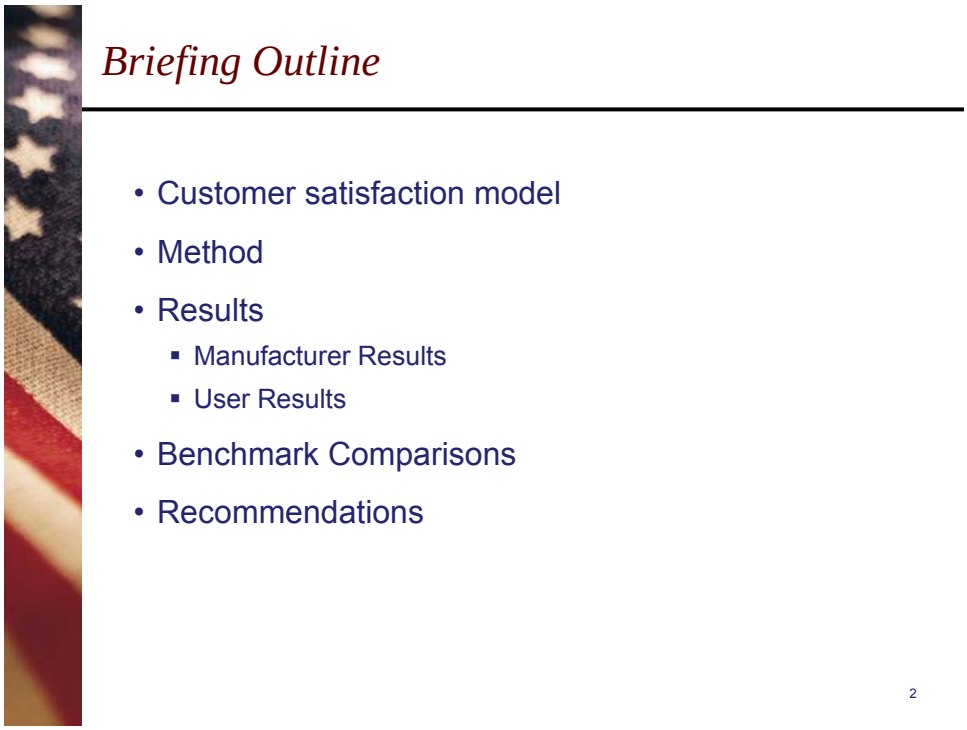
NIOSH PPT Program Evidence Package Aug 30, 2007

Appendix H Back to the AppendicesTable of Contents

Customer Satisfaction Survey Results

Appendix H provides results of the Customer Satisfaction Survey conducted by the Office of Personnel Management (OPM) for the PPT Program. The survey was implemented in the 1st quarter of FY 06. Survey results are presented and discussed along with ratings obtained in each of the areas of evaluation. The next survey will be conducted in the 1st quarter of FY 08.

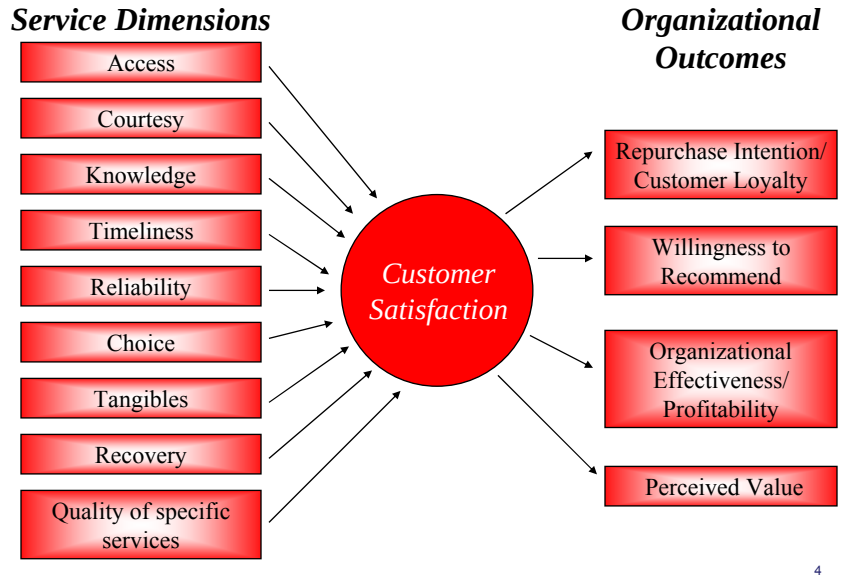

2005 NIOSH NPPTL
Customer Satisfaction Survey
Results for:
Manufacturer & User Customer Bases
Working for America
Customer Satisfaction Survey
United States Office of Personnel Management
Jennifer C. Hartenstine
Assessment Services


Briefing Outline
• Customer satisfaction model
• Method
• Results
▪ Manufacturer Results
▪ User Results
• Benchmark Comparisons
• Recommendations
2

Balanced Measures Framework

3

Customer Service Dimensions and Outcomes



4

Access

Availability of service and the ease with which it can be obtained (e.g., hours of operation, ease of finding someone to answer questions).

- It is easy to do business with NPPTL.
- Assistance from NPPTL personnel is provided at a time that is convenient to me.
- It is easy to find someone at NPPTL who can answer my questions.
- I do not have to cut through a lot of red tape to reach higher level NPPTL officials.
- I have adequate access to NPPTL personnel for advice and assistance.
- (Other items were customized for this dimension. These items are not used to calculate a dimension score.)

5

Courtesy

Attitudes relating to the behavior of the service provider to the customer (e.g., friendly, helpful, rude, considerate).

- NPPTL personnel are always willing to help me.
- NPPTL personnel are courteous.
- NPPTL personnel give individual attention to my requests for information or service.

6

Knowledge

Possession of required skills and knowledge to perform the service.

- NPPTL personnel are knowledgeable.
- NPPTL personnel have a good understanding of my organization's operation and mission.
- Explanations of technical issues are understandable.
- NPPTL personnel are able to explain NPPTL products and services.
- When NPPTL personnel do not know the answer, they refer me to an expert who does.
- (Other items were customized for this dimension. These items are not used to calculate a dimension score.)

7

Timeliness

Promptness in receiving or providing promised materials and/or service.

- Overall, NPPTL personnel provide timely service.
- (Other items were customized for this dimension. These items are not used to calculate a dimension score.)

8

Reliability

Ability to perform the promised service dependably, accurately, and consistently.

- NPPTL personnel give me accurate information.
- NPPTL personnel keep accurate records.
- NPPTL personnel provide services when promised.
- (Other items were customized for this dimension. These items are not used to calculate a dimension score.)

9

Choice

Response to a spectrum of needs of individual customers (e.g., range of choices, customization, made to order designs).

- NPPTL products and services are designed to meet customer needs.
- NPPTL personnel use suggestions from their customers to improve the quality of products and services.
- I am satisfied with the range of products and services provided by NPPTL.

10

Recovery

Problems and complaints are resolved quickly with minimal effort on the customer's part and problems do not recur.

- Problems and complaints are resolved quickly.
- Problems and complaints are resolved with minimal effort on the customer's part.
- There are well-defined systems for linking customer feedback and complaints to employees who can act on this information.
- NPPTL personnel are flexible in finding solutions to problems.
- I am satisfied with the way NPPTL personnel handle problems or mistakes.

11

Tangibles

Appearance of physical facilities, personnel, and communication materials. Includes non-personal communication such as advertising, pamphlets, reports and displays.

- NPPTL personnel present a professional appearance.
- I am satisfied with the appearance of written communication materials prepared by NPPTL.
- (Other items were customized for this dimension. These items are not used to calculate a dimension score.)

12

Quality

What the customer receives from the service provider or the perception of excellence of the product or service received.

- Overall, how would you rate the quality of products and service provided by NPPTL?
- (Other items were customized for this dimension. These items are not used to calculate a dimension score.)

13

Method: *The Surveys*

- Manufacturer & User Surveys
- Survey instruments include:
  - demographic items
  - OPM's core customer satisfaction items
  - NPPTL-specific items (customized for each survey) created with the help of NPPTL's customer satisfaction team
  - Surveys pilot-tested in October 2005
  - Obtained required OMB approval for distribution to public in December 2005
  - Online administration: December 5 - 23, 2005

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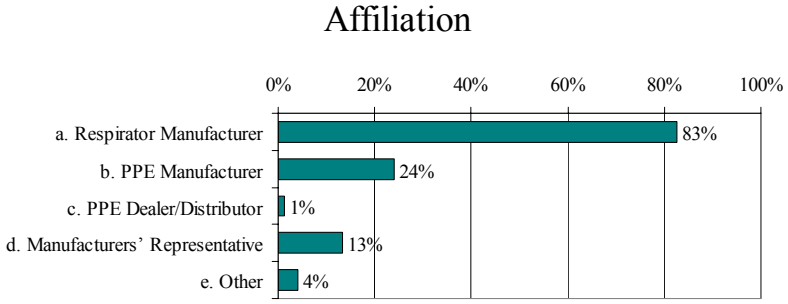
Method: *Response Rates*

Survey	*Response Rate*	*Margin of Error**
Manufacturer Survey	31% (75/243)	± 10%
User Survey	30% (185/622)	± 6%

* Conservative estimates

15

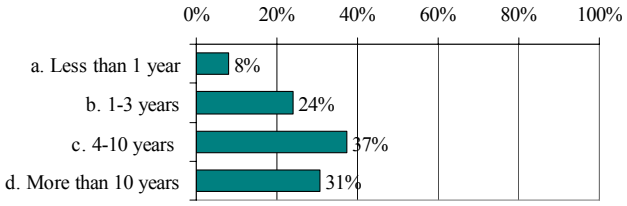
Results: *Manufacturers - Demographics*



16

Results: *Manufacturers- Demographics*

Time Dealing with NIOSH NPPTL



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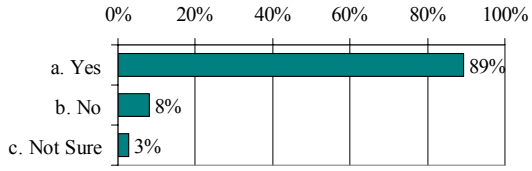
Results: *Manufacturers - Demographics*

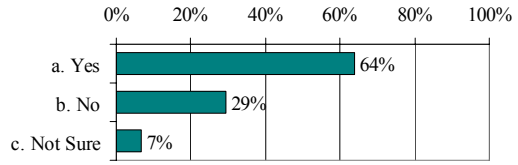
Contact in Past Year



18

Results: *Manufacturers – Training Received*

Training or Information Sessions in Past Year



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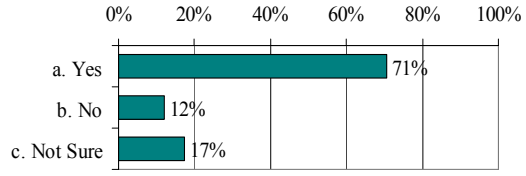
Results: *Manufacturers – Customer Loyalty*

Would you use NPPTL again?



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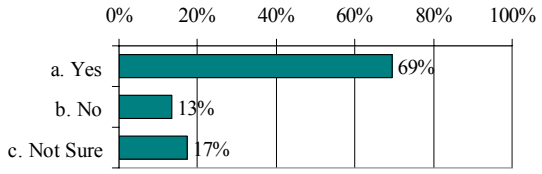
Results: *Manufacturers – Customer Loyalty*

Would you recommend NPPTL to others?



21

Results: *Manufacturers – Overall Satisfaction*

57. Overall, how satisfied are you with the services you are receiving from NPPTL?

60. Based on the service you have received..., how would you rate the quality of their services?

Favorable Neither Unfavorable

22

Guidelines for Interpreting Results

Favorability of Results

- Excellent: 90% - 100% favorable
- Good: 80% - 89% favorable
- Acceptable: 66% - 79% favorable
- Marginal: 50% - 65% favorable
- Critical: 0% - 50% favorable

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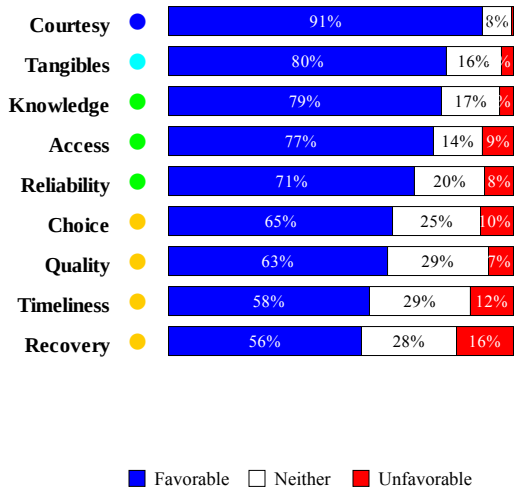
Results: *Manufacturers*



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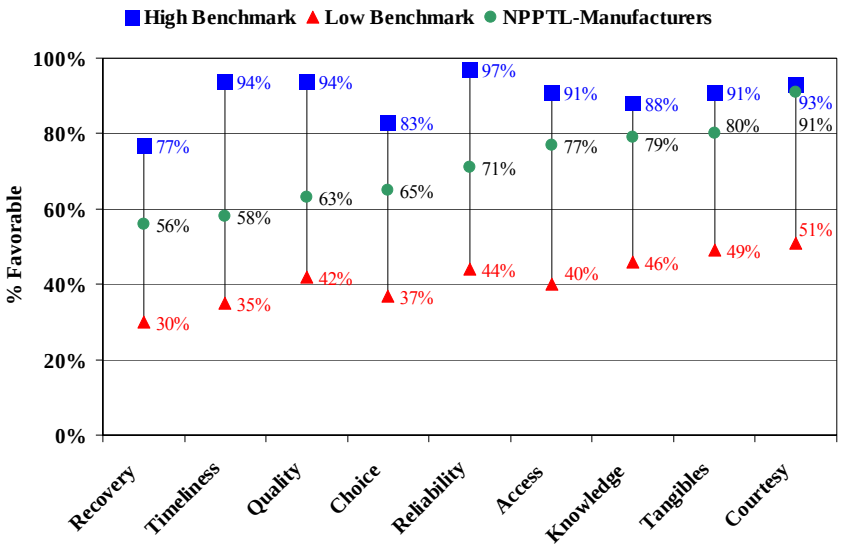
Benchmarks: Manufacturers



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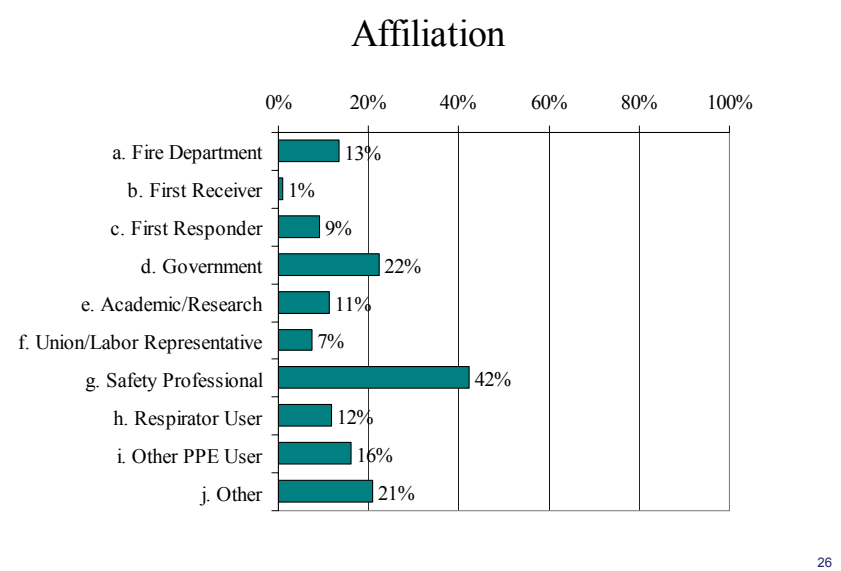
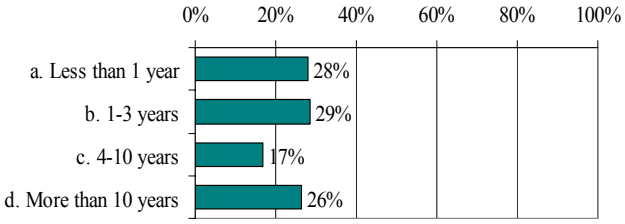
Results: *Users - Demographics*



26

Results: *Users - Demographics*

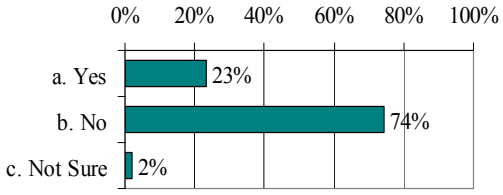
Time Dealing with NIOSH NPPTL



27

Results: *Users - Demographics*

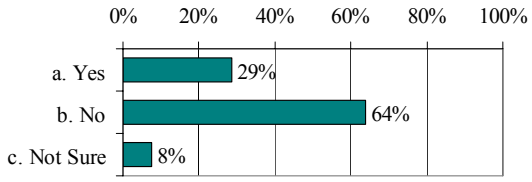
Contact in Past Year



28

Results: *Users – Training Received*

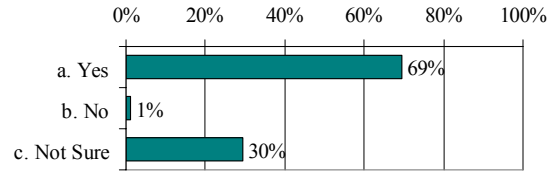
Training or Information Sessions in Past Year



29

Results: *Users – Customer Loyalty*

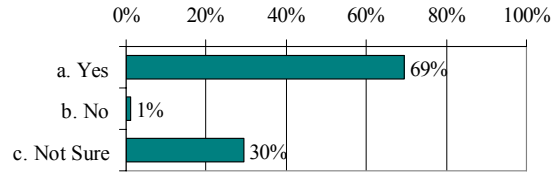
Would you use NPPTL again?



30

Results: *Users - Customer Loyalty*

Would you recommend NPPTL to others?



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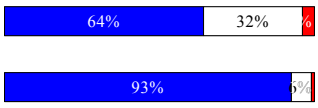
Results: *Users – Overall Satisfaction*

54. Overall, how satisfied are you with the services you are receiving from NPPTL?

57. Based on the service you have received..., how would you rate the quality their services?



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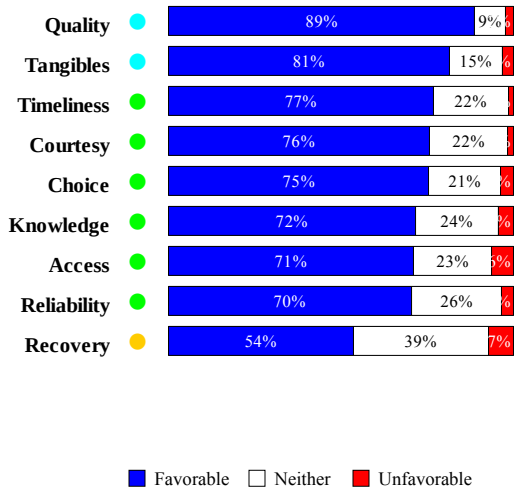
Results: *Users*



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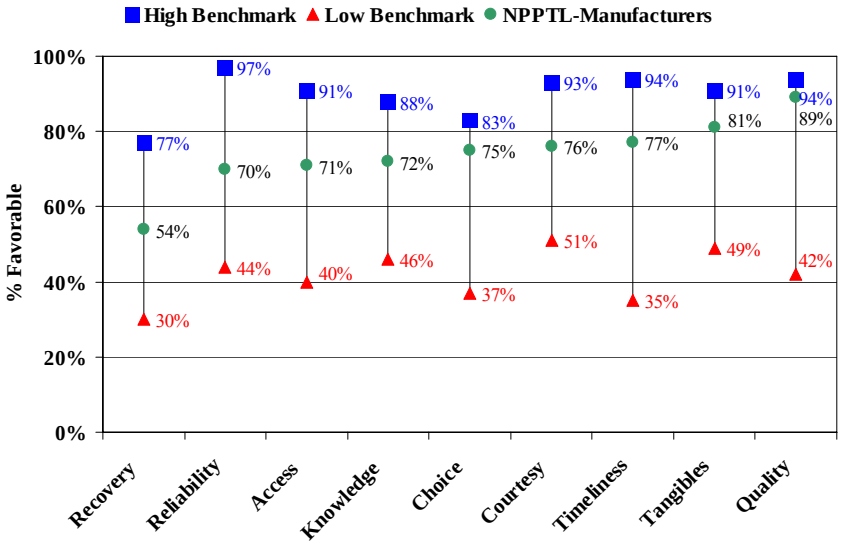
Benchmarks: Users



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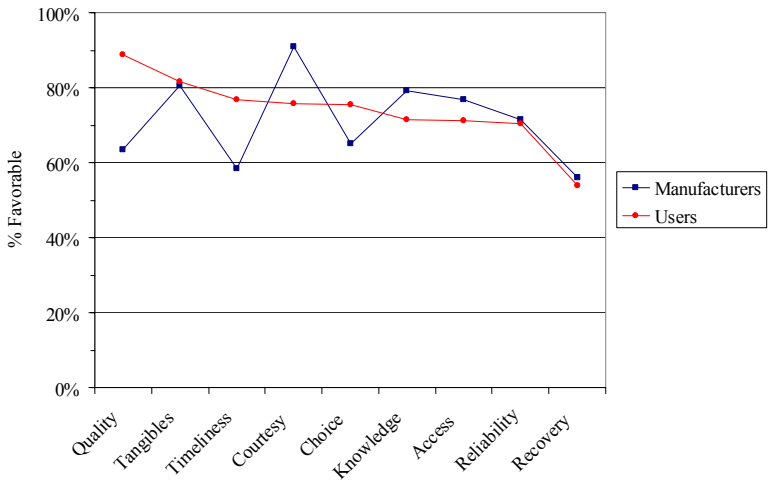
Results: *Dimension Profiles*



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Recommendations

- ✓ Review detailed data reports and comments
- ✓ Develop action plans to improve results
- ✓ Conduct focus groups with customers and service providers to explore results in depth and obtain suggestions for improvement
- ✓ Evaluate changes
- ✓ Resurvey

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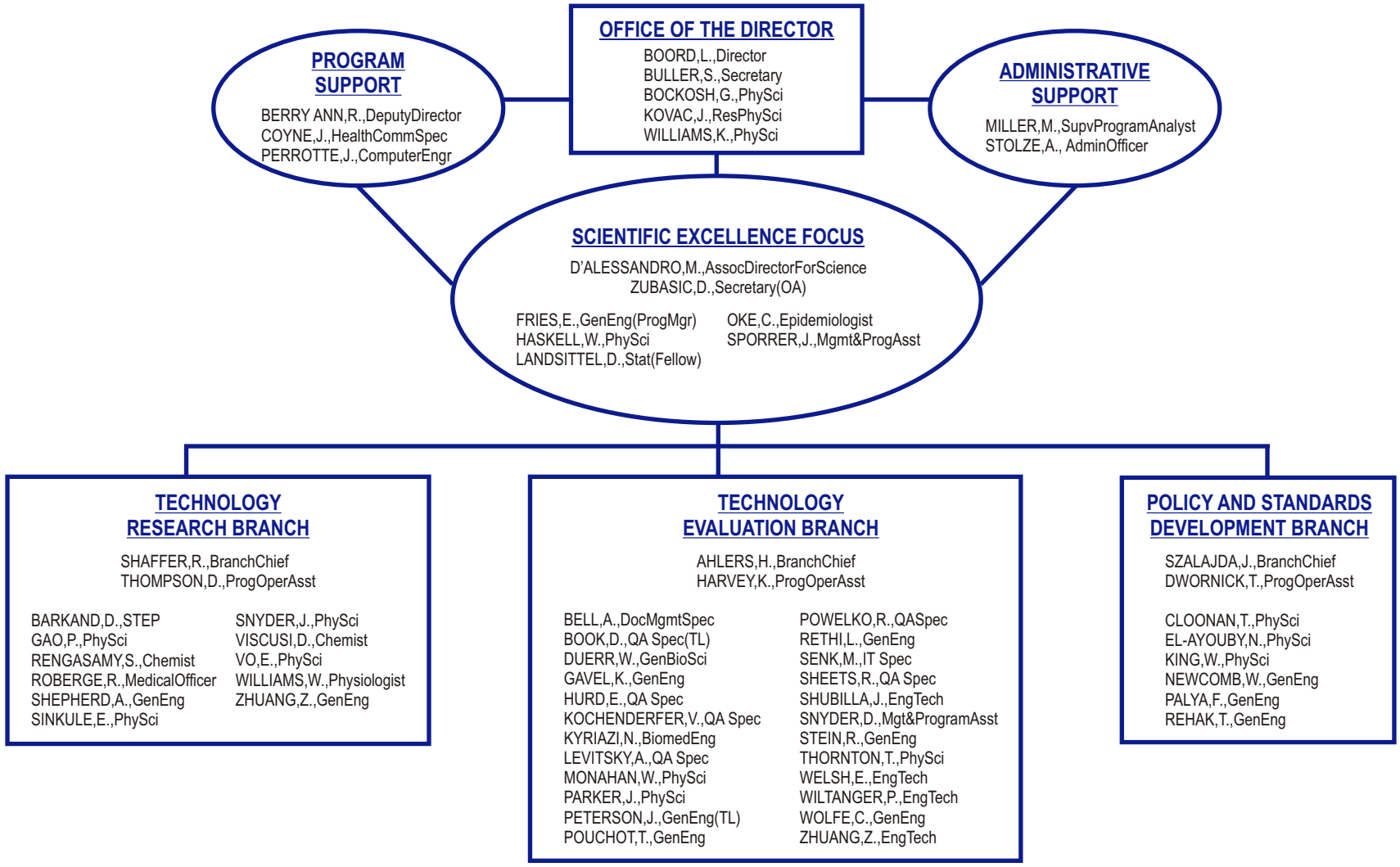
PPT Program Organization Chart

This organization chart includes only those personnel in NPPTL. Approximately 10 scientists from other divisions support the PPT Program through project collaboration. The number supporting the program varies depending on project needs.

NATIONAL PERSONAL PROTECTIVE TECHNOLOGY LABORATORY



August 2007

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PPT Program Funding Distribution

Appendix J contains the funding distribution for the PPT Program. This appendix includes the program's budget levels since Fiscal Year 2001. The funding allocations depict the spending levels for each goal area:

Reduction of Exposure to Inhalation Hazards
Reduction of Exposure to Dermal Hazards
Reduction of Exposure to Injury Hazards

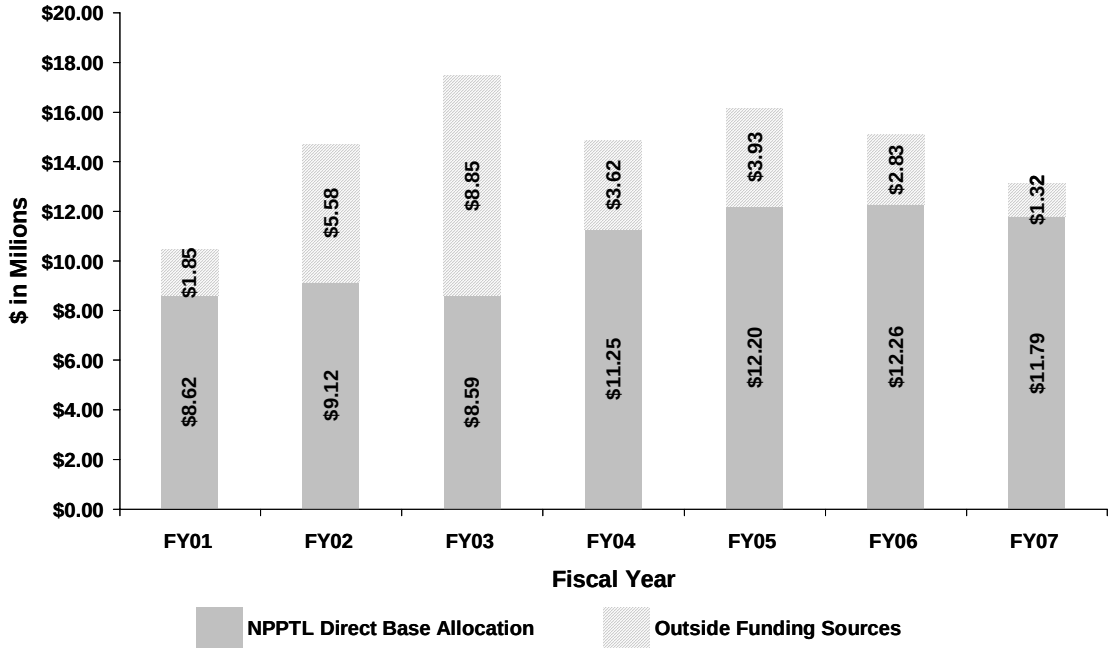
The distribution into the three goal areas provides a perspective of the level of activity within each goal area as represented by the amount of PPT funding relative to the overall PPT budget. The funding information to Reduce Exposure to Inhalation Hazards is further divided to separate funds allocated for Respirator Certification, Policy and Standard Development, and Research activities.

NIOSH PPT Program Evidence Package Aug 30, 2007
PPT Program Funding Distribution

PPT Program Funding Distribution FY01 - FY07

Funding Allocation	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL
NPPTL Direct Base Allocation	$8.62	$9.12	$8.59	$11.25	$12.20	$12.26	$11.79	$73.82
Outside Funding Sources*	$1.85	$5.58	$8.85	$3.62	$3.93	$2.83	$1.32	$27.97
Total:	**$10.46**	**$14.69**	**$17.44**	**$14.86**	**$16.13**	**$15.09**	**$13.10**	**$101.79**

*FY02, includes addl $1.7M CDC supplemental funding - renovation costs

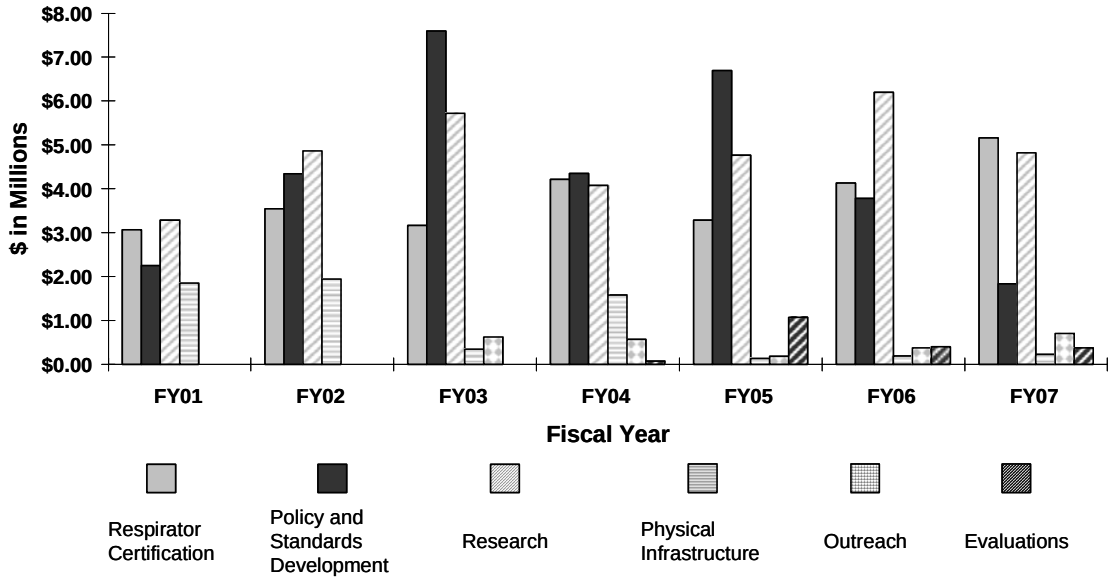


Total Funding Allocation FY01-FY07 = $101.79 Million

NIOSH PPT Program Evidence Package Aug 30, 2007
PPT Program Funding Distribution

PPT Program Funding Expended FY01 - FY07

Funds Expended	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL
Respirator Certification	$3.07	$3.54	$3.17	$4.21	$3.28	$4.13	$5.15	$26.55
Policy and Standards Development	$2.25	$4.34	$7.59	$4.35	$6.69	$3.78	$1.84	$30.84
Research	$3.29	$4.86	$5.72	$4.07	$4.76	$6.20	$4.81	$33.72
Physical Infrastructure	$1.86	$1.95	$0.35	$1.58	$0.14	$0.20	$0.23	$6.30
Outreach			$0.62	$0.57	$0.19	$0.38	$0.70	$2.45
Evaluations				$0.07	$1.08	$0.40	$0.37	$1.92
Total:	**$10.46**	**$14.69**	**$17.44**	**$14.86**	**$16.13**	**$15.09**	**$13.10**	**$101.79**



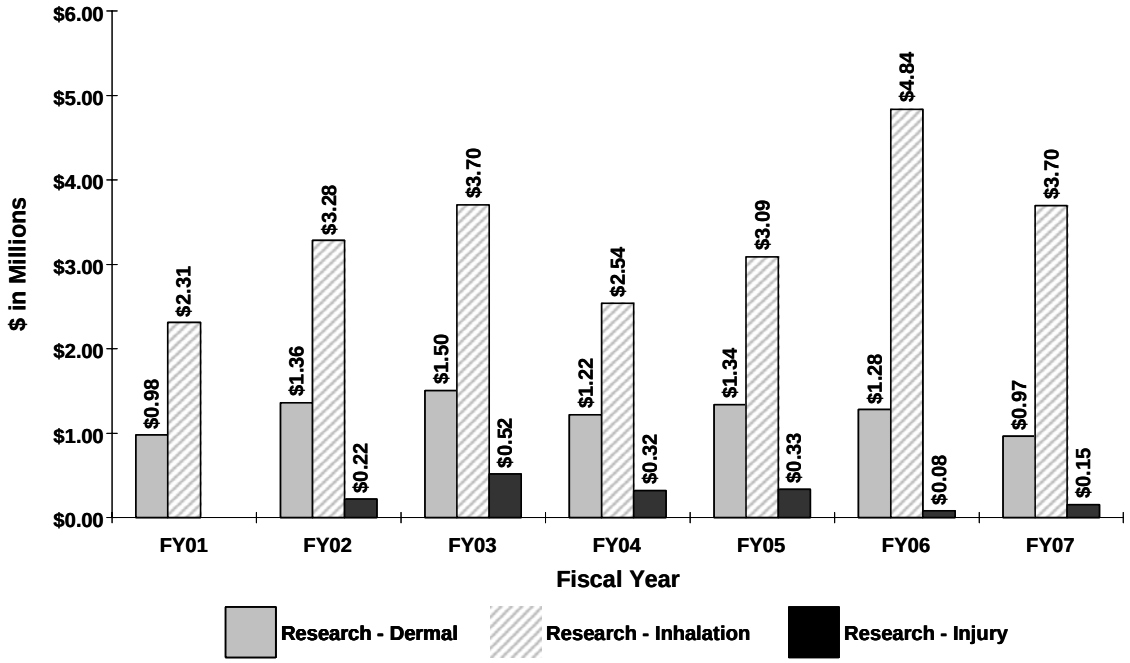
PPT Program Extramural Funding (in Millions of $)

Extramural Spending	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL
OEP Grants	$0.12	$0.78	$0.42	$1.07	$1.74	$2.25	$2.12	$8.49

NIOSH PPT Program Evidence Package Aug 30, 2007
PPT Program Funding Distribution

PPT Program Research Funding Distribution FY01 - FY07

Research Area	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
Research - Inhalation	$2.31	$3.28	$3.70	$2.54	$3.09	$4.84	$3.70	$23.46
Research - Dermal	$0.98	$1.36	$1.50	$1.22	$1.34	$1.28	$0.97	$8.64
Research - Injury		$0.22	$0.52	$0.32	$0.33	$0.08	$0.15	$1.62
Total:	**$3.29**	**$4.86**	**$5.72**	**$4.07**	**$4.76**	**$6.20**	**$4.81**	**$33.72**



NIOSH PPT Program Evidence Package Aug 30, 2007
PPT Program Funding Distribution

PPT Program Outside Funding (in Millions of $)

A. CDC TERRORISM FUNDING	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
a. CDC-BT BASE FUNDING (Bio Supplemental Funding -- Worker Safety)- Bioterrorism-Emergency Responder Respiratory/Personal Protection (CAN 7362)	$1.00	$1.24	$1.11	$1.10	$0.82			$5.26
b. CDC-BT - EMERG FUNDING (Bio Emergency Response -- Emerg Worker Initiative) - CAN AT22		$1.00						$1.00
c. CDC-BT FUNDING (Bio -- Respirator Research, Standards Dev. - Phase I and II) * - CAN 002J			$4.63	$2.34	FY04 carryover			$6.97
Subtotal Bioterrorism Funding:	**$1.00**	**$2.24**	**$5.74**	**$3.44**	**$0.82**			**$13.24**

B. SPECIAL CDC FUNDING - PANDEMIC	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
Influenza Pandemic (Technology Research Branch) - CAN Z4QL						$1.00		$1.00
Pandemic Funding - NPPTL Critical Tasks - Various CANs							$0.16	$0.16
Subtotal CDC Pandemic Funding:						**$1.00**	**$0.16**	**$1.16**

C. EXTERNAL FUNDING SOURCES - INTERAGENCY AGREEMENTS (less 9% CDC overhead)	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
NATIONAL INSTITUTE FOR STANDARDS AND TECHNOLOGY (NIST) FUNDING--Terrorism (IA 00-19 Receivable)	$0.85	$1.15	$2.98		$2.78	$1.50		$9.25
U.S. DEPT. OF NAVY - TSWG (IA 05-02 Receivable)					$0.15			$0.15
U.S. DEPT. OF NAVY - TSWG (IA 07-12 Receivable)							$0.06	$0.06
Fire Protection Resaerch Association (IA 07-25 Receivable)							$0.01	$0.01
OSHA FUNDING (IA 03-13 Receivable) - Develop user-friendly training package to accompany the change schedule calculation module by Los Alamos Natl Lab			$0.02					$0.02
Subtotal External Funding Sources:	**$0.85**	**$1.15**	**$3.00**		**$2.93**	**$1.50**	**$0.07**	**$9.50**

D. EXTERNAL FUNDING - OTHER CDC and NIOSH DIVISIONS	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
CDC Supplemental funding - Renovation costs		$1.70						$1.70
Emergency Worker Initiative -- Funding from DART (Cyrano Sciences contract)		$0.30						$0.30
MINER Act 2006							$0.61	$0.61

E. FEES (no CDC overhead assessed)	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
Respirator Certification Fees - CAN 7456		$0.18	$0.10	$0.12	$0.14	$0.13	$0.28	$0.95
CBRN Testing Fees - CAN PP35 (retained by NPPTL only)*		$0.01	$0.01	$0.05	$0.05	$0.20	$0.20	$0.51
Subtotal Fees:		**$0.19**	**$0.11**	**$0.17**	**$0.19**	**$0.33**	**$0.47**	**$1.46**

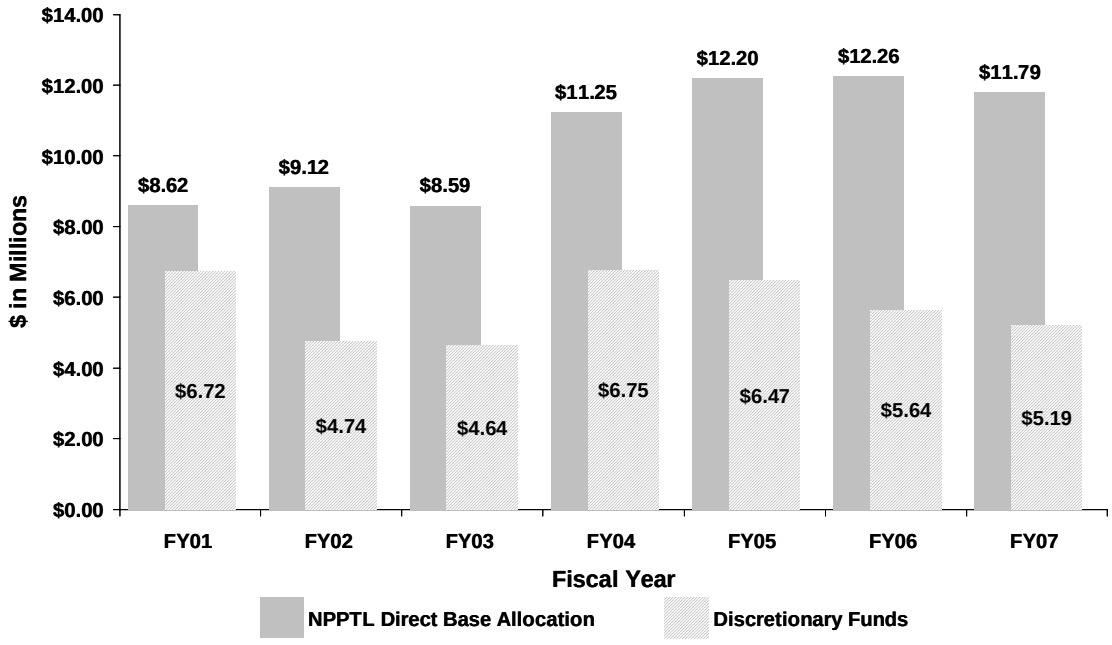
*Fees to RDECOM (IA 02-03), $3.26

FY01 - FY07 Total:	**$1.85**	**$5.58**	**$8.85**	**$3.62**	**$3.93**	**$2.83**	**$1.32**	**$27.97**

NIOSH PPT Program Evidence Package Aug 30, 2007
PPT Program Funding Distribution

PPT Program Discretionary Funding FY01 - FY07

Discretionary Funding	FY01	FY02	FY03	FY04	FY05	FY06	FY07	TOTAL
NPPTL Direct Base Allocation	$8.62	$9.12	$8.59	$11.25	$12.20	$12.26	$11.79	$73.82
Discretionary Funds	$6.72	$4.74	$4.64	$6.75	$6.47	$5.64	$5.19	$40.15



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NIOSH PPT Program Evidence Package Aug 30, 2007

Appendix K Back to the AppendicesTable of Contents

Laboratory Facilities

Appendix K provides descriptive overviews of the 30 laboratories operated to perform performance testing activities in the PPT Program's portfolio of projects.

26 are located in Pittsburgh, PA
3 are located in Morgantown, WV
1 is located in Cincinnati, OH

20 to conduct activities of Reducing Exposure to Inhalation Hazards goal
1 to conduct activities of Reducing Exposure to Dermal Hazards goal
9 to conduct activities of Reducing Exposure to Injury Hazards goal

This listing includes 4 laboratories (3 in Pittsburgh, PA and 1 in Cincinnati, OH) used to conduct activities to reduce exposure to injury hazards that are undergoing evaluation by other NIOSH programs.

Human Research Physiology Laboratory

The Research Physiology Laboratory is a 1200 square foot, temperature- controlled facility that comprises a main research laboratory, physician's examination room, and a research subject bathroom. The research laboratory is utilized to conduct human physiology experiments and houses associated instrumentation including a Vmax 229D Pulmonary Function / Cardiopulmonary Exercise Testing Instrument used to measure expired respiratory gases and monitor cardiac function during exercise testing.

Ancillary equipment includes AEI Technologies oxygen and carbon dioxide sensors and analyzers, a Trackmaster exercise treadmill, Dinamap automated sphygmomanometer, gurney, GSE 335 automated weighing scale, dedicated research computers, and full resuscitation equipment including a Banyan 900 resuscitation kit (ambu bag, endotracheal intubation equipment, drugs, etc.), suction apparatus, and supplemental oxygen. The physician's office is utilized by the research medical officer to conduct physical examinations and instrumentation of research subjects and includes standard examination equipment including an examination table, Welch-Allyn otoscope and ophthalmoscope combination, Baumann sphygmomanometer, reflex hammer and kits for drug and pregnancy testing. The subjects' bathrooms offer a standard commode and a shower and sink to enable subjects to refresh themselves after exercising.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 29

Automatic Breathing Machine Simulator Research Laboratory

The ABMS Research Laboratory is a 480 square foot facility dedicated to respirator research using the Automated Breathing and Metabolic Simulator (ABMS). The computer-controlled ABMS produces carbon dioxide (CO2) and simulates oxygen (O2) consumption at fixed breathing frequencies and tidal volumes to simulate human metabolic processes. The ABMS is an ideal device for evaluating inhaled CO2 and O2 concentrations in respirators due to its high degree of accuracy and repeatability in duplicating human CO2 production and O2 consumption. In the past, the ABMS was used in a NORA-funded project to characterize the inhaled CO2 and O2 concentrations and breathing pressures of 90 various models of powered and non-powered air-purifying respirators, supplied-air respirators, and gas masks. The egress helmet used by NASA shuttle astronauts, escape hood air-purifying respirators, and self-contained self-rescuer (SCSR) respirators used for escape by miners also have been investigated using the ABMS.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 29

Human Factor Chamber

Capable of human physiological or machine testing for all types of Personal Protective Equipment the chamber with an inside volume of 1080 cubic feet has a temperature range of -62oC (-80 oF) to 60oC (140oF) and humidity range of 20% RH to 95% RH conditions.

Ancillary equipment includes: an air lock. 2 subject observation windows, Woodway Treadmill and a programmable computer control, data monitoring and acquisition.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 21

Climatic Chambers (2 units / 1 laboratory)

Capable of subjecting all types of Personal Protective Equipment the chamber with an inside volume of 512 cubic feet has a temperature range of -68oC (-90 oF) to 121oC (250 oF), humidity range of 20% RH to 95% RH and meets MIL-STD-810E Test Standards.

Ancillary equipment includes: Ocenco Incorporated – Automated Breathing Metabolic Simulator (ABMS) is available and can be coupled to the chambers to conduct climatic studies on various types of Closed Circuit Breathing Devises and a programmable computer control, data monitoring and acquisition system.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 21

Vibration Test Units (2 units)

Capable of subjecting all types of Personal Protective Equipment or components to a wide range of shock and vibration conditions. This equipment can simulate conditions of many different modes of transport such as aircraft, helicopter, tracked, tire or rail vehicles.

The Vibration units specifications are 8,000 lbs Force in Sine and Random Modes, 220 “g” shock, 2 inch (51 mm) displacement, 1500 lbs Automatic Internal Pneumatic Load Support, computer controlled remote on-screen command/status panel to start-up and monitor the amplifier/shaker system operation and acquire & store data and three sets of containment fixtures for the CBRN certification testing

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 21

Flammability Test Rig

The flammability test laboratory has a 1 to 6 Burner System equipped with head-form on an adjustable platform, driven by an adjustable synchronous drive motor to test personnel protective equipment to the NIOSH CBRN standard and EN 136 equipment criteria.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 21

Certification Laboratory

The certification laboratory is a collect of four facilities (Gas Testing, Particulate Testing, Supplied Air / PAPR Testing and IAA Fit / Tensile & Cold Testing) that are part of NIOSH's mandated respirator certification program.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 37

Fit Test Laboratory

The Fit Test Laboratory's function is to test and evaluate the wellness of fit of respiratory protective systems for identified segments of the population for certification and product surveillance and investigations. It includes three facilities (Lab Respiratory Protection Level (LRPL) Laboratory & Control Room, Total Inward Leakage (TIL) Laboratory with Portacount Testing Units and an Iso Amyl Acetate Fit Test Chamber, and Classroom / Communication Test Laboratory).

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 40

High Flow Aerosol Test Laboratory

NIOSH currently has two high-flow filter testers to perform particulate penetration testing of filters, respirator cartridges, and filter media at gas flow rates up to 500 standard liters/minute. These two high-flow filter testers include a TSI Inc. Certitest Model 3120 Automated Filter Tester and an Air Techniques International TDA-500P Penetrometer. Both high-flow filter testers use dioctyl phthalate (DOP) to generate an aerosol with a count median particle diameter of 0.19 to 0.20 micron (meets 42 CFR Part 84) and provide fast, reliable filter efficiency measurements for penetrations as low as 0.001% (99.999% efficiency). Both filter testers contain microprocessors to control the test process and provide outputs from test instruments for gas flow rate, filter test bed differential pressure, and aerosol concentration upstream and downstream of the filter test bed. Light-scattering photometer technology is employed for aerosol detection whereby the particle concentration upstream of the filter being tested is compared to the downstream particle concentration measurement. Due to the higher pressure drop across the filter bed associated with high-flow testing (>100 standard liters/minute), both filter testers use a stand-alone vacuum pump to draw the aerosol-laden gas stream through the aerosol transport system. A TSI Model 3080 Electrostatic Classifier and a TSI Model 3025A Condensation Particle Counter are being used to characterize the aerosol generated by each filter tester.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 104

Chemical Protective Clothing Laboratory

The chemical protective clothing (CPC) laboratory (approximately 800 sq ft) contains various instruments to conduct a broad range of studies in chemical permeation and penetration through CPC materials and deterioration of the materials' physical properties as well. These include an Agilent 6890 gas chromatography/5973 mass spectrometry (GC/MS) system, a Hitachi D-7000 High Performance Liquid Chromatography (HPLC) system, and two MIRAN 1A gas analyzers for determining chemical permeation and penetration; a LLOYD/AMETAK Single Column Testing System for measuring tensile strength and elongation of CPC materials as indicators of material degradation after repeated exposures and decontaminations, etc. The research program is aimed at protecting the skin from chemical hazards that may be encountered in the workplace or during a terrorist attack.

Strategic Goals: Dermal

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 143

Sensor Technology Laboratory

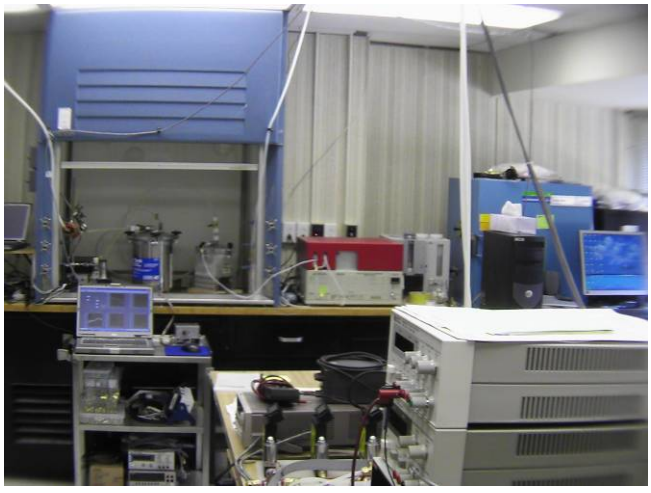
The Sensor Technology Laboratory is a 350 sq ft laboratory with a fume hood and bench space. Several setups are available to evaluate micro chemical sensors with environmental controls of temperature, contaminate concentration, flow rate, and relative humidity. The flows range from a liter per minute to several hundred liters per minute and humidity from 10 percent to 100 percent. Organic contaminants can be generated from parts per billion (ppb) to thousands of parts per million (ppm). Sensors can be evaluated in both a purely scientific experimental mode as well as an air purifying respirator cartridge simulation mode.
Electronic equipment is available in this laboratory to conduct electrical evaluations of sensor systems by such means as generation of I-V curves.

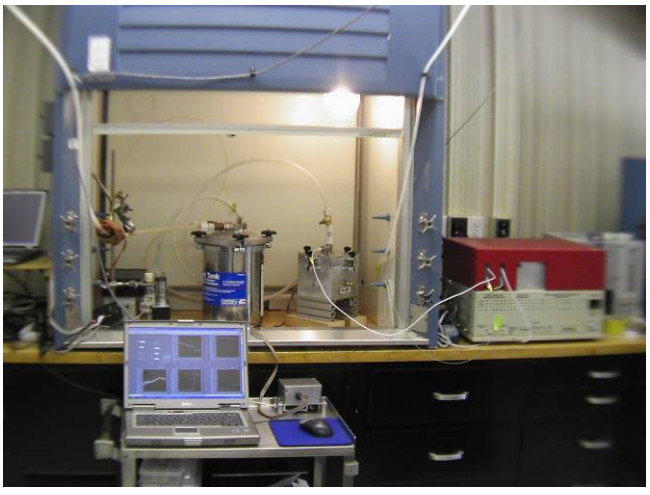
Equipment available in the laboratory includes, a respirator cartridge simulator, several Miller/Nelson Research model HCS-401 flow, temperature and humidity controlling units, laptop computers loaded with LabView data collection software, Agilent No. 3497 source meter, an Agilent No. E3647A data logger, a Keithley function generator No. 2700, and a Keithley 2400 source meter. A SRI, Inc model 8610 gas chromatograph and an EdgeTeck Dewmaster humidity meter, a SH55E Scott Breathing Simulator manufactured by Scott Aviation Corporation, an M6 pump manufactured by Valco Instruments Co. and a dry gas meter manufactured by American Meter Co. completes the inventory of major equipment used in the laboratory.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 144





Man Test Certification Laboratory

The Man Test Certification Laboratory is a group of three facilities (Automated Breathing Metabolic Simulator Laboratory, Long-Term Field Evaluation of Closed Circuit Escape Apparatus and Man Test Certification Laboratory - Self Contained Breathing apparatus). The SCBA testing requirements include a series of man tests during which men are required to use the breathing apparatus while performing a set of work tasks. The series of man tests are called Test 1 through Test 4. Test 1 familiarizes the man with the apparatus; Tests 2 and 3 involve more difficult work tasks while also evaluating the comfort and fit; and Test 4 provides the most severe physiological test. The set of work tasks in each test is dependent on the service time (anticipated life) of the apparatus; that is, 15 minutes, 30 minutes, etc. The man tests call for crawling on hands and knees, walking, and running, all of which are performed on a level treadmill at 1.5, 3.0, and 6.0 mph, respectively. The laddermill (vertical treadmill) is also used, but as a safety precaution it is inclined at 30^{o} from the vertical instead of 15^{o}. The speed is increased in order to maintain the same vertical speed because the physiological responses are a function of the vertical work. An overcast in underground mines is a device which allows one air current to cross over another without interruption. During federal man tests a man is required to carry a 50 lb. sack over a simulated overcast; but an overcast could not be installed in the laboratory. Substitution for the overcast activity of treadmill walking at 4.7 mph can be made without change in the physiological cost. The physiological requirements of pulmonary ventilation, oxygen uptake, and carbon dioxide elimination change as the man proceeds from one work task to the next. Detailed knowledge of these physiological requirements is necessary for the proper design and approval of breathing apparatus.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 02

Corn Oil Fit Test Chamber Laboratory

The Corn Oil Fit Test Chamber Laboratory is specially equipped with a Dynatech 222-8A two-person walk-in test chamber with an airlock capable of conducting 2 corn oil aerosol fit tests simultaneously. This area is used for conducting comparative fit test analyses as well as other respiratory protective devices.

Facilities include a Dynatech System 000 Computer Automated Fit Test Instrument as well as an Air Techniques TDA-2GF Aerosol Photometer.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 13

Aerosol Research Laboratory

The Aerosol Research Laboratory contains equipment for the generation and detection of various types of small-diameter (typically below 400nm) mono- and polydisperse and nanoparticle aerosols for use in penetration testing of protective equipment, e.g. filter facepiece respirators (both flat sealed and mounted on headforms), protective ensemble components and clothing, and flat media.

Facilities include a TSI 3160 Fractional Efficiency Filter Tester, TSI Model 8130 Automated Filter Tester, 3 TSI 3080 Scanning Mobility Particle Sizers, 2 Model 3321 TSI Aerodynamic Particle Sizers Spectrometer, 3 Model 3025 A Condensation Particle Counters (CPC), Model 3775 CPC, and TSI Model 3025A-S Ultrafine CPC, and TSI Model 3480 Electrospray Aerosol Generator and TSI Model 3085 NANO DMA. In addition, several types of atomizers and a variety of other particle generation devices are available.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 13

Anthropometric Research Laboratory

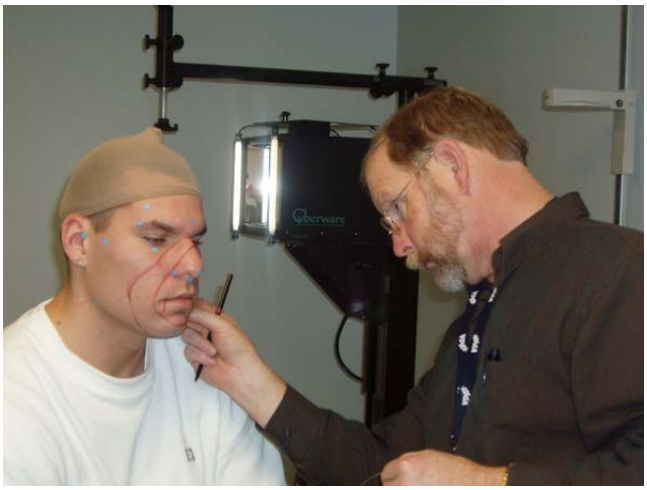
The Anthropometric Research Laboratory is a specially prepared room free of direct sunlight. This is necessary because it houses a Cyberware® Model 3030 Head and Face Color 3D head scanner used to digitize the profile and capture the shape of a human subject's head and face in a few seconds. The scanning process captures an array of digitized points, with each point represented by x, y, z coordinates for shape and 24-bit RGB coordinates for color. This data is then immediately transferred to a graphics workstation for immediate viewing and modification. This technology offers PPT Program researchers the ability to explore potential improvements in respiratory protection by using scan data to improve the representativeness of respirator fit test panels and improve mask design. This laboratory is also used to conduct PortaCount® and other respirator fit testing experiments.

Facilities include: 4 Model 8028 PortaCount® Plus Universal Fit Test Systems and 1 Occupational Health Dynamics Model 3000 Respirator Fit Test System.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 13



Microbiology Laboratory

The Microbiology Laboratory is one component of the laboratory complex particularly suited for conducting standard and routine microbiological experiments. These experiments are conducted under the protection of a SterilGARD III Biological Safety Cabinet to ensure the bioaerosol safety of the associated researchers. A Steri-Cult CO_2 Controlled Humidity Incubator for culturing bacteria and viruses is used in the assessment of decontamination efficacy for biological challenges to healthcare workers. The incubator provides a control of temperature and humidity allowing for the simulation of various environmental conditions that may be encountered during respirator use and storage and offers a haven of optimum growth conditions for various biological specimens. An Eddy Jet Spiral Plater and Flash and Grow Colony Counter automate the enumeration of bacteria and virus cultures.

Facilities include a Market Forge Automatic Sterilmatic Steam Pressure Sterilizer, Thermo Electron Corporation Multipurpose Refrigerated Centrifuge, Gyromax Orbital Incubator Shaker, New Brunswick Scientific Co. Tissue Culture Roller Drum, and sundry other equipment useful in microbiological studies.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 13

Analytical Chemistry Laboratory

The Analytical Chemistry Laboratory is a recently renovated state-of-the-art chemistry laboratory designed to accommodate a gamut of analytical equipment used to investigate the performance, quality, reliability and efficacy of respirators and personal protective equipment and clothing. The array of test equipment provides the PPT Program with the capabilities to analyze liquid, gas and other types of samples in support of various PPT Program projects.

Facilities include a six-foot fume hood, 2 ceiling mounted ventilation extractor arms and three islands of bench top counter space used to accommodate a variety of analytical equipment including: 2 MIRAN 1A gas analyzers, MIRAN Sapphire XL IR gas analyzer, Waters 2690 Liquid Chromatograph, HP 6890/5973 Gas Chromatograph/Mass Spectrometer, Entech Model 7100A Automated Preconcentrator, 2 Entech Model 7023A-L MiniCan Autosamplers, Entech Model 4600A Dynamic Diluter, Entech Model 3120-A Canister Cleaning System, Perkin-Elmer Spectrum FTIR (Fourier Transform InfraRed) Spectrometer, Perkin-Elmer N6119 Gas Chromatograph, Perkin-Elmer Model ATD Thermal Desorber, SRI Model 8610 Gas Chromatograph and various other ancillary ovens, incubators and electronic balances. Additionally this laboratory is equipped with a central vacuum and medical grade compressed air system and a Millipore Direct Q5 water purification system.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 13

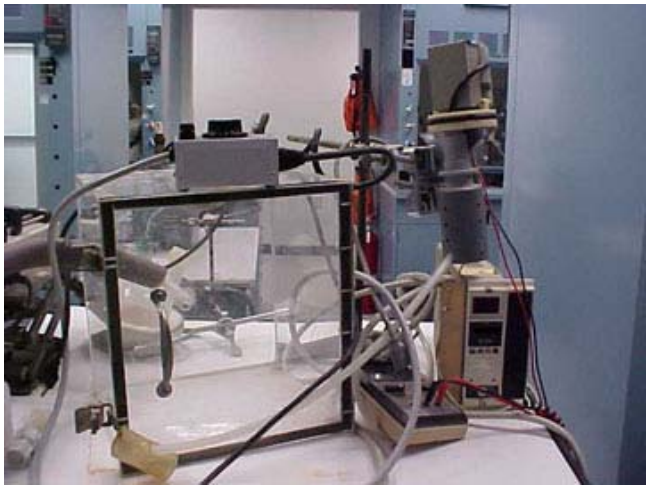
Corrosive Gas Testing Laboratory

The Corrosive Gas Testing Laboratory is used for respirator cartridge and canister testing under the NIOSH respirator certification program. Corrosive gases for which respirators may be approved include chlorine, chlorine dioxide, hydrogen chloride, hydrogen fluoride, CS tear gas and CN tear gas. The laboratory may also be used for testing against mercury vapor. The laboratory has 2 fume hoods in which the testing is performed. Test gas mixtures are made using Model HCS-401 Miller-Nelson Flow, Temperature and Humidity Controllers with the introduction of measured amounts of pure gases to create the required airflows and concentrations of challenge gases. The challenge gases are passed through the respirator cartridges, canisters or powered air-purifying blower assemblies with cartridges mounted in a test chamber. Challenge or upstream concentrations are measured by using the Radiometer America Multi-Titration System or Thermo Spectronic Genesys 10 Spectrophotometer. Certified calibration gases are used to calibrate the detectors. Relative humidity and temperature are measured with Edge Tech Model 2000 Dew-Prime II chilled-mirror type hygrometers. Downstream or breakthrough detection is performed with Interscan or CEA Instrument detectors or the UV-VIS spectrophotometer, in the case of tear gas. Mercury is detected with Arizona Instruments Mercury Vapor Analyzer. Airflows are calibrated with American Meter Co. dry test meters and Gilibrator primary standard airflow calibrator.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 108



Firefighter SCBA Evaluation Laboratory

The Firefighter SCBA Evaluation Laboratory is used for the inspection and testing of self-contained breathing apparatus which have been involved in firefighter injuries or fatalities. It includes a 6000 psi breathing air compressor and safety enclosure for filling SCBA cylinders. Video recording equipment is used to document the inspection and testing process.

There is equipment for performing the following NIOSH certification tests: Positive Pressure Test, Rated Service Time Test, Gas Flow Test, and Remaining Service Life Indicator Test. In addition, equipment for conducting the NFPA Air Flow Performance Test is located in the laboratory.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 108

Cough Aerosol Laboratory

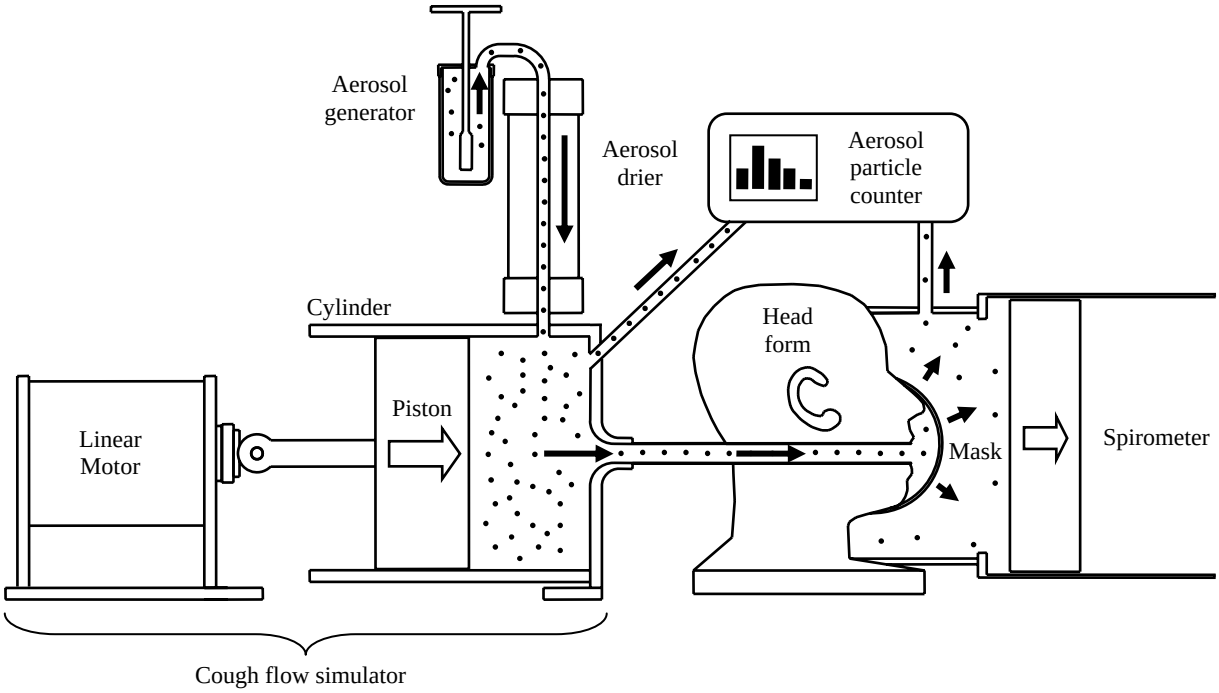
The Cough Aerosol Laboratory includes a Cough Aerosol Mask Test system, shown below. This system is used to test how well masks and respirators block aerosol particles produced during coughing from being released into the environment. The system works like this: The aerosol generator and drier produce a test aerosol and send it into the chamber of the cough flow simulator below. The cough flow simulator "coughs" the aerosol through the mask that is mounted on the head form. The aerosol particle counter measures the aerosol concentration before and after the aerosol flows through the mask. The number of downstream particles divided by the number of upstream particles gives the aerosol penetration, which is the percentage of particles that flow past the mask and into the environment.

In addition to this system, there are two TSI 3160 mask & filter testers, a TSI 8122 PAPR test system, and several aerosol particle analyzers. Future plans to expand these capabilities include construction of a 0.6 m x 0.6 m x 2.7 m simulated cough box and a 2.7 m x 2.7 m x 2.4 m high simulated medical examination room to be used in evaluating the protection offered by PPT against simulated cough-generated aerosols.

Strategic Goals: Inhalation

Site: Health Effects Lab Division, Morgantown, WV

Building: L



Hearing Loss Prevention Unit

The Hearing Loss Prevention Unit (HLPU) is a mobile lab for taking NIOSH Mining hearing loss prevention research to include research from PPT Programs relating to hearing protectors to workers and their families. On the outside, it is a 32-foot trailer towed by a heavy-duty pickup truck. Inside the sound-insulated trailer is a full hearing research clinic consisting of a four-person testing booth and a training/counseling area. It contains instruments to perform extensive hearing valuations, a one-of-a-kind system that fit-tests hearing protectors for four people at once, and computers to control all of the instruments. The laboratory also contains an audiovisual training system.

The HLPU can be configured to perform a wide range of research tasks. It has been used to perform experiments on a new earplug insertion technique, evaluate a training program using hearing test feedback, and support a study on more effective hearing loss prevention programs.

Strategic Goals: Injury

Site: Pittsburgh Research Lab, Pittsburgh, PA

Building: Mobile

Hemi-Anechoic Chamber

The Hemi-Anechoic Chamber, which was completed in February, 2006, utilizes Eckel Supersoft Panels on the walls and ceiling to yield a free-field over a reflecting plane. The interior dimensions of the room are approximately 16.7 meters long by 10.1 meters wide by 7.0 meters high yielding a volume of approximately 1200 cubic meters. The chamber meets the requirements of the ISO 3744 standard down to approximately 100 Hz. This chamber will be utilized primarily for noise source identification (NSID) testing. The Hemi-Anechoic Chamber is equipped with a Bruel & Kjaer Pulse data acquisition system with 46 inputs and 2 output channels and a 42-microphone Bruel & Kjaer beamforming array which is used in this chamber for NSID purposes. In addition to NSID testing, the Hemi-Anechoic Chamber may be used to measure sound power levels according to ISO 3744.

Strategic Goals: Injury

Site: Pittsburgh Research Lab, Pittsburgh, PA

Building: 154

Auditory Research Laboratories (2)

Two hearing protector laboratories (Cincinnati and Pittsburgh) were fully remodeled in 2003. They include a reverberation room with the same state of the art data collection, analysis, and reporting system to run standard hearing protector tests. The lab in Pittsburgh with a volume of roughly 1,300 cubic meters is accredited by NVLAP for the measurement of real ear attenuation of hearing protection devices in accordance with test standard ANSI 12.6-1997 R2002.

Acoustic test fixtures in Cincinnati include the French-German Institute de Saint Louis impulsive-noise test fixture, the Bacou-Dalloz ear muff test fixture and the Knowles Electronic Manikin for Acoustic Research (KEMAR). The Pittsburgh chamber has an ear-muff test fixture developed by Michaels and Associates in Pittsburgh.

The labs contain clinical audiometers (which include high-frequency test capability), tympanometers, otoacoustic emission measurement systems, and a hearing aid analyzer. The Cincinnati facility also includes a small audiometric test room similar to those commonly found in occupational settings; this is used to evaluate the feasibility of test strategies in an occupational versus clinical environment. An additional small-animal noise-exposure and test facility has been installed at the University of Cincinnati Biological Sciences Department. These facilities are capable of conducting auditory evoked potential and otoacoustic emission testing.

Strategic Goals: Injury

Site: Pittsburgh Research Lab, Pittsburgh, PA and DART Cincinnati, OH

Building: 154

Motion Analysis Lab

Data on human movement is useful for simulation modeling (using virtual humans) and for biomechanical studies. Force plates measure forces at the feet which, when combined with motion data from the motion analysis capture system, provide information regarding the loads experienced by the joints of the body during work activities. EMG equipment measures muscle activity, which is used to estimate muscular fatigue and the force needed to perform a task. This laboratory allows researchers to test new methods of performing work under controlled conditions, so that physical stresses can be minimized and injury risk can be reduced. Specific equipment located in this laboratory includes: Motion AnalysisCorporation 12 camera Eagle System, Noraxon TeleMyo 2400R 16 Channel Base System, Biometrics Portable 4 Channel EMG System SX2300 (4), Biometrics Dual Axis Goniometers, and K100 Amplifier Base Unit.

Strategic Goals: Injury

Site: Pittsburgh Research Lab, Pittsburgh, PA

Building: 152

Human Performance Research Lab

Due to the dynamic nature of the mining environment, an actual operating mine is not suitable for most worker task studies. The Human Performance Research Mine allows researchers to study task specific risk factors and ergonomic intervention possibilities in a simulated underground mine setting with actual mining equipment. Studying these tasks and interventions before introducing them to the field helps to ensure useable and effective designs. Each study can be performed with varying seam heights and entry widths. The simulated mine accommodates portable EMG and Motion Analysis systems, making possible detailed research on the physical requirements of mining tasks and the capabilities of mine workers. The research mine is also available to support studies in other PPT Program focus areas.

Strategic Goals: Injury

Site: Pittsburgh Research Lab, Pittsburgh, PA

Building: 152

Mining Illumination Laboratory

Miners depend most heavily on visual cues to recognize underground mining hazards such as falls of ground, pinning and striking, slipping and tripping hazards; therefore, illumination plays a critical role in a miner's safety. The Mine Illumination Laboratory (MIL) is a simulated environment that approximates the physical geometries and spectral properties of an underground coal mine. This laboratory enables researchers to test the impact of various lighting systems with respect to a person's on-axis and peripheral visual performance which is critical for hazard detection. Additionally, the MIL enables discomfort and disability glare testing. Specific equipment located in this laboratory includes: Peripheral motion detection apparatus, PR650 SpectraScan Colorimeter, Human observation station, and a Data acquisition and control system.

Strategic Goals: Injury

Site: Pittsburgh Research Lab, Pittsburgh, PA

Building: 152

Anthropometry Laboratory

The NIOSH Anthropometry Laboratory is a 28 by 20 by 9 foot facility for the development of anthropometric databases of the working population. Research is focused on the ergonomic performance of safety equipment and industrial tools. Three laser scanning systems (whole body scanner, head scanner and hand-and-product scanner) and a halogen-based system (Inspeck scanner) are available for use in a wide variety of research applications. Current activities include fall protection harness sizing research, farm tractor cab accommodation, glove design for firefighters, eyewear design, and fit enhancement of respirators.

Strategic Goals: Injury

Site: Division Safety Research, Morgantown, WV

Building: H

Life Support Laboratory/Long-Term Field Evaluation of SCSRs

The Life Support Laboratory has been developed to test all aspects of the performance of closed-circuit breathing apparatus (CCBA), a relatively obscure and complex type of respiratory protective equipment needed mainly for underground coal mining emergencies. The Lab contains an Automated Breathing and Metabolic Simulator and a treadmill, both with monitoring instrumentation to evaluate closed-circuit breathing apparatus for human performance stressors – levels of inhaled CO_2, O_2, wet- and dry-bulb temperatures, and breathing pressures. The Life Support Lab is used for the evaluation of Self-Contained Self-Rescuers (SCSRs) deployed in underground coal mines: the Long-Term Field Evaluation of SCSRs. This program includes targeting, collecting, replacing, and testing over 200 SCSR per year. In addition to performance testing, the evaluation includes assessment of the adequacy of mine inspection, and reporting the occurrence of hidden damage (primary concern), whether from manufacturing defects, environmental degradation, or deployment impact.

Strategic Goals: Inhalation

Site: National Personal Protective Technology Laboratory, Pittsburgh, PA

Building: 02

Hand-Arm Vibration Laboratory

The Hand-Arm Vibration Laboratory includes a unique 3-D Hand-Arm Vibration Test System, a 1-D Hand-Arm Vibration Test System, a Scanning Laser Vibrometer, two Hand Force Measurement Systems, several types of Vibration Health Effect Measurement Devices, several sets of Data Acquisition and Analysis Systems. These equipments and devices are used to perform the experimental studies of hand-transmitted vibration exposure, biodynamic responses of the hand-arm system, anti-vibration gloves, hand forces, and health effects of the vibration exposure.

Strategic Goals: Injury

Site: Health Effects Lab Division, Morgantown, WV

Building: L

Room: B206

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List of PPT Projects and Associated Laboratory Facilities

Appendix L lists the 34 projects currently in the PPT Program's portfolio of active projects classified under the Goal to Reduce Exposures to Inhalation Hazards. Each project name corresponds to the name provided on the CD where a link to a project Quad Chart that succinctly identifies the project's objective, milestones, partners and stakeholders and outputs is provided. Resource allocation charts and project narrative descriptions are also accessible through each project's link.

A list of the 11 projects currently in the PPT Program's portfolio of active projects classified under the Goal to Reduce Exposures to Dermal Hazards is provided. Each project name corresponds to the name provided on the CD where a link to a project Quad Chart that succinctly identifies the project's objective, milestones, partners and stakeholders and outputs is provided. Resource allocation charts and project narrative descriptions are also accessible through each project's link.

Similarly a list of the 9 projects currently in the PPT Program's portfolio of active projects classified under the Goal to Reduce Exposures to Injury Hazards is provided. Each project name corresponds to the name provided on the CD where a link to a project Quad Chart that succinctly identifies the project's objective, milestones, partners and stakeholders and outputs is provided. Resource allocation charts and project narrative descriptions are also accessible through each project's link. These projects include those undergoing evaluation by other NIOSH Programs.

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List of PPT Projects and Associated Laboratory Facilities

Inhalation Projects FY07	Organization	Project Officer	* Lab Facility
Aerosol Generation by Cough-HELD	HELD	William Lindsley	20
Air Purifying Respirator Smoke Cartridge Evaluation for FF Overhaul & Wildland Ops	NPPTL – PSD	William Haskell	N/A
CBRN Respirator Standards	NPPTL – PSD	Jon Szalajda	2, 3, 4, 7, 9, & 28
CBRN SCBA Guidance Documents	NPPTL – PSD	Terry Cloonan	N/A
Certified Product Investigation Process (CPIP)	NPPTL – TEB	Lynn Rethi	3-8, 12, 18, 19 & 28
Chemical Warfare Agent (CWA) Simulant Project	NPPTL – PSD	Frank Palya	N/A
Closed Circuit SCBA	NPPTL – PSD	Frank Palya	3, 4, 7, 8, 12, & 28
Closed-Circuit Escape Respirator (CCER) Standard	NPPTL – PSD	Tim Rehak	2 & 28
CO_2 Deadspace Test System	NPPTL – PSD	Jon Szalajda	N/A
Development and Evaluation of Nanofiber based filter media	NPPTL – TRB	Appavoo Rengasamy	14
Development of Computer-Aided Face-Fit Evaluation Methods	NPPTL – TRB	Ziqing Zhuang	15
Fire Fighter SCBA Evaluations	NPPTL – TEB	Vance Kochenderfer	7, 18, & 19
Frequency of Fit Testing	NPPTL – TRB	Ziqing Zhuang	13 & 15
Hybrid and Dockable SCSR Development	NPPTL – OD	George Bockosh	7, 12, & 28
Information Management Systems Support Contract – DEIMS Redevelopment	NPPTL – OD	John Perrotte	N/A
Laboratory Tests for TIL	NPPTL – TRB	Ziqing Zhuang	13 & 17
Long Term Field Evaluation (LTFE) of SCSRs	NPPTL – TEB	Heinz Ahlers	28
Long Term Field Evaluation of Special Respirators	NPPTL – TEB	Robert Stein	7 & 28
Metabolic Evaluation of N95 Respirator Use w/ Surgical Masks	NPPTL – TRB	Ed Sinkule	2
Multi-Function PAPR	NPPTL – PSD	Tim Rehak	N/A
New Methods for ESLI and Change out Schedules	NPPTL – TRB	Jay Snyder	11
New Sensor Technology Development for ESLI	NPPTL – TRB	Jay Snyder	11
PAPR Standard, Industrial PAPR	NPPTL – PSD	Jon Szalajda	1 3, 4, 7, 9, & 28
Penetration of Nanoparticles through NIOSH Approved respirator filters	NPPTL – TRB	Appavoo Rengasamy	14
Quality Assurance Module	NPPTL – PSD	William Newcomb	N/A
Quality System Assessment and Records	NPPTL – TEB	David Book	N/A
Respirator Certification Fees	NPPTL – TEB	David Book	N/A
Respirator Testing and Certification	NPPTL – TEB	Heinz Ahlers	3-8, 12, 18, & 19
Respirator Use Epi-Aid-DRDS & EPI-AID	DRDS	Chris Coffey	N/A
Reusability of Filtering Facepiece Respirators	NPPTL – TRB	Ron Shaffer	14, 16, & 17
SAR module	NPPTL – PSD	Frank Palya	N/A
SCSR Training Modules	NPPTL – PSD	Tim Rehak	N/A
Surveillance of Programs Using Respirators (SPUR)	NPPTL – OD	Brent Doney	N/A
Total Inward Leakage (TIL)	NPPTL – PSD	William Newcomb	8

* See last page for corresponding # of Laboratory Facility description

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List of PPT Projects and Associated Laboratory Facilities

Dermal Projects FY07	Organization	Project Officer	* Lab Facility
Chemical Warfare Agent (CWA) Simulant Project	NPPTL – PSD	Frank Palya	N/A
Colorimetric Indicators (consultant only / transfer activities)	NPPTL – TRB	Evanly Vo	N/A
Degradation and Decon Efficacy of Chemical Protective Clothing	NPPTL – TRB	Pengfei Gao	10
Development and Validation of PPE Preconditioning Methods	NPPTL – TRB	Angie Shepherd	10
Development of PPE Ensemble Test Methods	NPPTL – TRB	Pengfei Gao	10 & 14
Improved Criteria for Emergency Medical Protective Clothing (EMS)	NPPTL – TRB	Angie Shepherd	N/A
Improvement and Comparison of Ensemble Integrity Tests	NPPTL – TRB	Angie Shepherd	N/A
Next Generation Structural Fire Fighting PPE Ensemble	NPPTL – TRB	W. Jon Williams	1 & 3
Physiological Models and Countermeasures	NPPTL – TRB	W. Jon Williams	1 & 3
Risk Based Permeation Criteria	NPPTL – TRB	Angie Shepherd	10
Stored Thermal Energy in Firefighter Protective PPE	NPPTL – OD	William Haskell	N/A

* See last page for corresponding # of Laboratory Facility description

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Injury Projects FY07	Organization	Project Officer	* Lab Facility
Determination of PASS Mission Requirements	NPPTL – TEB	Robert Stein	NA
Develop Hearing Protection Laboratory and Fit-Testing Methods	DART	William Murphy	23
Effectiveness of Hearing Protection Against Impulsive Noise	DART	Chucri Kardous	23
Hearing Protection and Audibility Considerations	PRL	Amanda Azman	21, 22, & 23
Measurement and Rating Methods for Real-World Performance of Hearing Protectors	DART	William Murphy	23
Select and Develop Vibration Isolation Devices to Prevent Hand-Arm Vibration Syndrome	HELD	Renguang Dong	29
Sensory-Enhanced Balance Control at Elevated Workplaces	DSR	Peter Simeonov	25 & 27
Suspension Tolerance in Men and Women Wearing Safety Harnesses	DSR	Nina Turner	27
Worker Empowerment Interventions for Hearing Loss Prevention	PRL	Robert Randolph	21, 22, & 23

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Infrastructure Projects FY07	Organization	Project Officer	* Lab Facility
Business Systems for NPPTL (APEX)	NPPTL – OD	Ken Williams	N/A
Communication and Outreach Overall Plan (R2P Plan)	NPPTL – OD	Judi Coyne	N/A
Customer Satisfaction Program	NPPTL – OD	Maryann D'Alessandro	N/A
ISO 17025 Implementation	NPPTL – TEB	David Book	N/A
National Academy of Science Involvement in NPPTL	NPPTL – OD	Maryann D'Alessandro	N/A
PPT Cross-Sector Program (NORA Implementation Team)	NPPTL – OD	Maryann D'Alessandro	N/A
Standards Development – Organizational Committee Support – ANSI	NPPTL – OD	Roland Berry Ann	N/A
Standards Development – Organizational Committee Support – ASTM	NPPTL – OD	William Haskell	N/A
Standards Development – Organizational Committee Support – ISO	NPPTL – OD	William Newcomb	N/A
Standards Development – Organizational Committee Support – NFPA	NPPTL – OD	William Haskell	N/A

* See last page for corresponding # of Laboratory Facility description

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List of PPT Projects and Associated Laboratory Facilities

#	Laboratory Facility	Location / Bldg	Strategic Goal
1	Human Research Physiology Laboratory	29	Inhalation
2	Automatic Breathing Machine Simulator Research Laboratory	29	Inhalation
3	Human Factor Chamber	21	Inhalation
4	Climatic Chambers	21	Inhalation
5	Vibration Test Units	21	Inhalation
6	Flammability Test Rig	21	Inhalation
7	Certification Laboratory	37	Inhalation
8	Fit Test Laboratory	40	Inhalation
9	High Flow Aerosol Test Laboratory	104	Inhalation
10	Chemical Protective Clothing Laboratory	143	Dermal
11	Sensor Technology Laboratory	144	Inhalation
12	Man Test Certification Laboratory	2	Inhalation
13	Corn Oil Fit Test Chamber Laboratory	13	Inhalation
14	Aerosol Research Laboratory	13	Inhalation
15	Anthropometric Research Laboratory	13	Inhalation
16	Microbiology Laboratory	13	Inhalation
17	Analytical Chemistry Laboratory	13	Inhalation
18	Corrosive Gas Testing Laboratory	108	Inhalation
19	Firefighter SCBA Evaluation Laboratory	108	Inhalation
20	Cough Aerosol Laboratory	L - Morgantown, WV	Inhalation
21	Hearing Loss Prevention Unit	Mobile	Injury
22	Hemi-Anechoic Chamber	154	Injury
23	Auditory Research Laboratory (2)	Pittsburgh 154 and DART Cincinnati, OH	Injury
24	Motion Analysis Laboratory	152	Injury
25	Human Performance Research Laboratory	152	Injury
26	Mining Illumination Laboratory	152	Injury
27	Anthropometry Laboratory	H - Morgantown, WV	Injury
28	Life Support Laboratory / Long-Term Field Evaluation of SCSRs	2	Inhalation
29	Hand-Arm Vibration Laboratory	L-206B - Morgantown, WV	Injury

* See last page for corresponding # of Laboratory Facility description

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List of PPT Sponsored Conferences, Workshops and Public Meetings

Appendix M lists 39 Sponsored Conferences, Workshops and Public Meetings selected from current and former projects' activities in the PPT Program's portfolio of projects. These activities represent a sampling of activities that serve as both an input to the PPT Program and as outreach and transfer activities.

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List of PPT Sponsored Conferences, Workshops and Public Meetings

1. NIOSH Sponsored PPT Public Meetings:

Long-Team Field Evaluation Program Concept
March 22, 2007, DoubleTree Hotel, Pittsburgh Airport, Pittsburgh, PA
The NIOSH PPT Program solicited public input for the redesign of the Long-Term Field Evaluation (LTFE) program for self-contained self-rescuers (SCSRs) used in the mining industry. The LTFE program for self-contained self-rescuers (SCSRs) for miners was initiated more than 20 years ago by the U.S. Bureau of Mines. The objective for the LTFE program is to obtain data to determine the expected performance characteristics of SCSRs used in the mining industry. LTFE program results based on scientific principles can provide useful information to monitor expected SCSR performance and assess possible degradation due to the physical stresses of in-mine use. Of utmost concern is the successful performance of any SCSR that passes its inspection criteria specified by the manufacturer. It is such apparatus that must be relied upon in an emergency.
http://www.cdc.gov/niosh/npptl/resources/certpgmspt/meetings/032207/lttr-032207.html

National Personal Protective Technology Laboratory Public Meeting
October 12-13,2006, Crowne Plaza, Pittsburgh South, Fort Couch Road, Pittsburgh, PA
New programs for the approval of Powered, Air-Purifying Respirators (PAPRs), Total Inward Leakage (TIL), the Quality Assurance (QA) module, and the Administrative module were discussed as well as future NIOSH research projects for PPT.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-101206.html

NIOSH PPT Program Closed Circuit Escape Respirator (CCER) Public Meeting
September 28, 2006, Colorado School of Mines, Golden, Colorado.
This is the second of two NIOSH PPT Program public stakeholder meetings in September 2006 to discuss proposed Closed Circuit Escape Respirator (CCER) regulatory changes. NIOSH is developing these proposed changes in cooperation with the Mine Safety and Health Administration (MSHA). Examples of CCERs include self-contained self-rescuers (SCSRs) used in the mining industry and emergency escape breathing devices (EEBDs).
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-082106.html

NIOSH PPT Program Closed Circuit Escape Respirator (CCER) Public Meeting
September 19, 2006, Marriott Key Bridge, Arlington, Virginia.
This is the first of two NIOSH PPT Program public stakeholder meetings in September 2006 to discuss proposed Closed Circuit Escape Respirator (CCER) regulatory changes. NIOSH is developing these proposed changes in cooperation with the Mine Safety and Health Administration (MSHA). Examples of CCERs include self-contained self-rescuers (SCSRs) used in the mining industry and emergency escape breathing devices (EEBDs).
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-082106.html

National Institute for Occupation Safety and Health Public Meeting : Discuss Expediting the Respirator Certification Process, Isoamyl Acetate (IAA) Testing, N95 Filtering Facepiece Priority, CBRN NFPA 1981 Standard, and Changes to Post-Certification Audit Selection
April 27, 2006, Marriott Key Bridge Hotel, Arlington , Virginia
Fit-test instructions, speeding up the respirator certification process, isoamyl acetate (IAA) testing, equipment malfunctions, N95 filtering facepiece priority, and CBRN NFPA 1981 Standard and changes to post-certification audit selection.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-031606-pubmt.html

National Institute for Occupational Safety and Health Public Meeting: Continue Discussions of Concepts for Standards for Approval of Respirators for Use Against Chemical, Biological, Radiological, and Nuclear Agents (CBRN) and Concepts for Standards for a Multi-Function Powered, Air-Purifying Respirator (PAPR) - Docket Numbers NIOSH-008, NIOSH-010, and NIOSH-039
December 13, 2005 , Sheraton Station Square Hotel, Pittsburgh , Pennsylvania
Addressed concepts for standards for CBRN Closed-Circuit, Self-Contained Breathing Apparatus (SCBA), CBRN Powered, Air-Purifying Respirator, and a Multi-Function PAPR. Detailed information was provided in the federal register announcement that was posted.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-121305.html

National Institute for Occupational Safety and Health Public Meeting: Continued Discussions of Concepts for Standards for Approval of Respirators for Use Against Chemical, Biological, Radiological and Nuclear Agents (CBRN) and Guidelines for Their Use; and Concepts for Standards for a Multi-Function Powered Air Purifying Respirator (PAPR), Docket Numbers NIOSH-008, NIOSH-010 and NIOSH-039
July 19-20,2005, Holiday Inn Select Pittsburgh South, Pennsylvania.
Continued discussions of concepts for standards and testing processes for PAPR and Closed Circuit, SCBA suitable for respiratory protection against CBRN agents. NIOSH also introduced concepts for establishing multi-function PAPR requirements and guidelines for use of NIOSH-approved CBRN respirators.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-062305.html

National Institute for Occupational Safety and Health Public Meeting: Continued Discussions for Concepts of Powered Air-Purifying Respirator (PAPR) Standards and Introduction of Concepts for Closed Circuit, Self Contained, Breathing Apparatus Standards Development Efforts Used for Respiratory Protection Against Chemical, Biological, Radiological, and Nuclear (CBRN) Agents, Docket Numbers NIOSH-010 and NIOSH-039
December 15,2004, Sheraton Station Square, Pittsburgh, PA
Continued discussions of conceptual standards and testing processes for PAPR standards suitable for respiratory protection against CBRN agents. NIOSH introduced conceptual requirements for Closed Circuit, Self Contained Breathing Apparatus suitable for respiratory protection against CBRN agents.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-111204.html

National Institute for Occupational Safety and Health Public Meeting: Began Initial Discussions for Concepts of Total Inward Leakage (TIL) Requirements and Test Methods for Halfmask Respirators Including Elastomeric and Filtering Facepiece Styles, Docket Number NIOSH-036
August 24,2004, Marriot Key Bridge Hotel, Arlington, VA
Began initial discussions for concepts of total inward leakage (TIL) requirements and test methods for halfmask respirators including elastomeric and filtering facepiece styles.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-071404.html

National Institute for Occupational Safety and Health Public Meeting: Continued Discussions for Concepts of Powered Air-Purifying Respirator (PAPR) Standards Development Efforts Used for Respiratory Protection Against Chemical, Biological, Radiological, and Nuclear (CBRN) Agents, Docket Number NIOSH-010
May 4, 2004 , Hilton Garden Inn, Pittsburgh/Southpointe, Cannonsburg,PA
Continued discussions of conceptual standards and testing processes for powered air-purifying respirator (PAPR) standards suitable for respiratory protection against CBRN agents.

National Institute for Occupational Safety and Health Public Meetings: Initiated Conceptual Discussions for Powered Air Purifying Respirator Standards Development Efforts Used for Respiratory Protection Against Chemical, Biological, Radiological, and Nuclear (CBRN) Agents, Docket Number NIOSH-010, and Quality Assurance Standards Module for Respiratory Protective Equipment, Docket Number NIOSH-001
October 16,2003, Radisson Hotel at Waterfront Place, Morgantown, WV
CBRN Public Meeting initiated conceptual discussions of standards and testing processes for powered air purifying respirator standards suitable for respiratory protection against CBRN Agents.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-092403.html

National Institute for Occupational Safety and Health Public Meeting: Continued Conceptual Discussions for Escape Respirator Standards Development Efforts Used for Respiratory Protection Against Chemical, Biological, Radiological, and Nuclear (CBRN) Agents, and Provided an Update on the Quality Assurance/Administrative Module
June 25, 2003, Hilton Garden Inn Pittsburgh/Southpointe, Canonsburg,PA
Continued conceptual discussions of concepts being considered for CBRN Escape Respirator standards and provided an update on the development of the Quality Assurance/Administrative module
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-060403.html

National Institute for Occupational Safety and Health Public Meeting: Continued Conceptual Discussions for Escape Respirator Standards Development Efforts Used for Respiratory Protection Against Chemical, Biological, Radiological, and Nuclear (CBRN) Agents
April 29,2003,Radisson Hotel Pittsburgh Green Tree, Pittsburgh, PA
Continued conceptual discussions of concepts being considered for CBRN Escape Respirator
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-041003.html

National Institute for Occupational Safety and Health Public Meeting: Discussed Standards for Respiratory Devices Used to Protect Workers in Hazardous Environments
April 10, 2003, Marriot Key Bridge Hotel, Arlington, VA
Provided an opportunity for an exchange of information between the Agency and respirator manufacturers, industry representatives, labor representatives, and others with an interest in respiratory protection
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-031103a.html

National Institute for Occupational Safety and Health Public Meeting: : Discussed Standards Development Efforts for Full Facepiece Air-Purifying Respirators (APR) Used to Protect Emergency Response Workers Against Chemical, Biological, Radiological and Nuclear (CBRN) Agents and Air-Purifying Escape Respirators to Protect Workers Against CBRN Agents
June 18-19, 2002, Sheraton Station Square, Pittsburgh, Pennsylvania,
Concepts discussed for appropriate standards and testing processes for full-facepiece air-purifying respirators suitable for use by first responders against CBRN Agent
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-052402.html

Stakeholder Meeting: Setting a Research Direction for the National Personal Protective Technology Laboratory
April 4-5, 2001, Coraopolis, PA
The purpose of this meeting was to solicit Stakeholder input for NIOSH PPT projects and stakeholder recommended programs with the PPT areas of program emphasis.

2. NIOSH Sponsored PPT Manufacturer Meetings:

Respirator Manufacturers Meeting April 10th, 11th, and 12th, 2007
April 10-12, 2007, NIOSH-NPPTL, Pittsburgh, PA
http://www.cdc.gov/niosh/npptl/resources/certpgmspt/meetings/041007/lttr-041007.html

National Institute for Occupational Safety and Health (NIOSH), National Personal Protective Technology Laboratory (NPPTL), hosted a meeting for all respirator manufacturers.
October 11, 2006, Crowne Plaza Pittsburgh South, Pittsburgh,(Bethel Park), PA
Respirator certification topics were addressed. A tentative agenda is attached.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-101106.html

National Institute for Occupational Safety and Health (NIOSH), held a meeting for all respirator manufacturers
December 12, 2005 , at the NIOSH site in Pittsburgh , Pennsylvania .
Addressed replacement rates, and alternatives to the silica dust tests for powered, air-purifying respirators (PAPRs), labeling for filtering facepiece respirators and a Standard Application Procedures (SAP) Workshop
http://www.cdc.gov/niosh/npptl/resources/certpgmspt/meetings/121205/agenda.html

National Institute for Occupational Safety and Health (NIOSH), National Personal Protective Technology Laboratory (NPPTL), Respirator Branch: Respirator manufacturers
July 21, 2005, Holiday Inn Select Pittsburgh South, Pittsburgh, PA
Topics addressed included discussion of the Standard Application Procedures (SAP) comments, moving forward to implement the release of the procedures, new NPPTL and Respirator Branch organizational structures, and follow-up on replacement documents.
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-052005.html

National Institute for Occupational Safety and Health (NIOSH), National Personal Protective Technology Laboratory (NPPTL), Respirator Branch, meeting for all respirator manufacturers.
April 13, 2005, Sheraton Station Square Hotel, Pittsburgh , PA
Topics addressed included discussion of the Standard Application Procedures (SAP) comments, moving forward to implement the release of the procedures, new NPPTL and Respirator Branch organizational structures, and follow-up on replacement documents
http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/lttr-031105.html

3. NIOSH Sponsored PPT Workshops and Meetings:

Scientific Workshop. Committee on Personal Protective Equipment for Healthcare Workers during an Influenza Pandemic
February 22, 2007 - February 22, 2007, Lecture Room of the National Academy of Sciences at 2100 C Street, NW, Washington, DC
http://www.iom.edu/CMS/3740/39644/39679.aspx

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List of PPT Sponsored Conferences, Workshops and Public Meetings

Committee on Personal Protective Equipment for Healthcare Workers During an Influenza Pandemic
December 13, 2006 - December 13, 2006
Keck Center of the National Academies of Science ,Washington, DC
http://www.iom.edu/CMS/3740/39644/39658.aspx

NIOSH Nanotech Conference
December 4-7, 2006,Cincinnati, OH
NIOSH information related to personal protective technology and nanotechnology

NTTC Workshop on Self-Contained Self-Rescue Breathing Systems (SCSR)
July 25,2006, Beaver, WV
The SCSR workshops were conducted to solicit information from SCSR user groups and technology developers that will be considered in development of design criteria for the next-generation SCSR. The workshops covered each of the major design elements: size, amount of oxygen to be provided, weight, and other issues.
http://www.nttc.edu/clients/nioshworkshop/workshopnotes.asp

Assessment of the NIOSH Head-and-Face Anthropometric Survey of U.S. Respirator Users
July 10-11, 2006, Meeting 3, NIOSH NPPTL, Pittsburgh, Pennsylvania.
During this meeting the committee heard from respirator manufacturers and the sponsor. Additionally, the committee was given the opportunity to tour the National Personal Protective Technology Laboratories (NPPTL).
http://www.nap.edu/execsumm_pdf/11799.pdf

Committee on Personal Protective Equipment in the Workplace
June 5-6, 2006, NIOSH-NPPTL, Pittsburgh, PA
http://www.iom.edu/CMS/2957.aspx?show=2;3;9;10;1#LP1
Standing Committee on Personal Protective Equipment for Workplace Safety and Health
March 13, 2006 - March 13, 2006, National Academy of Sciences, Keck Center, Washington, DC
http://www.iom.edu/CMS/3740/29908/33318.aspx

NTTC Workshop on Self-Contained Self-Rescue Breathing Systems
December 8,2005, Pittsburgh, PA
The SCSR workshops were conducted to solicit information from SCSR user groups and technology developers that will be considered in development of design criteria for the next-generation SCSR. The workshops covered each of the major design elements: size, amount of oxygen to be provided, weight, and other issues.
http://www.nttc.edu/clients/nioshworkshop/workshopnotes.asp

Assessment of the NIOSH Head-and-Face Anthropometric Survey of U.S. Respirator Users
December 8-9, 2005, The National Academy of Sciences, Washington, DC
The committee used this meeting to gain a deeper understanding of the sponsor's perspectives on the study of the potential impact the revised panel will have on outside parties. Following that second meeting, the work of that committee was put on hold, so that several members of that committee and the Academies staff could answer an urgent request from the Department of Health and Human Services regarding the potential reusability of respirators (see the IOM report *Reusability of Facemasks During an Influenza Pandemic: Facing the Flu,* 2006). During this interim period, the committee continued to communicate via e-mail and discuss questions central to their statement of task.
http://www.nap.edu/execsumm_pdf/11799.pdf

Review of the NIOSH BLS Respirator Use Survey
December 1-2, 2005, The National Academies Building, Washington, DC
This meeting was the first meeting of the NIOSH PPT sponsored initiative contracted to the National Academies to evaluate the NIOSH BLS Respirator Use Survey. The purpose of this review was to critique the survey and render judgment on the fitness and relevance of the survey methodology to provide valid information that would guide respiratory protection decision making in the future. This effort is serving as an input to future PPT Surveillance initiatives.
http://www.nap.edu/execsumm_pdf/11799.pdf

Assessment of the NIOSH Head-and-Face Anthropometric Survey of U.S. Respirator Users
November 3-4, 2005, The National Academies Building, Washington, DC
This meeting was the first meeting of the NIOSH PPT sponsored initiative contracted to the National Academies to evaluate the NIOSH BLS Respirator Use Survey. The purpose of this review was to critique the survey and render judgment on the fitness and relevance of the survey methodology to provide valid information that would guide respiratory protection decision making in the future. This effort is serving as an input to future PPT Surveillance initiatives.
http://www.nap.edu/execsumm_pdf/11799.pdf

Standing Committee on Personal Protective Equipment for Workplace Safety and Health
November 02, 2005 ,Board Room of the National Academy of Science, Washington, DC
In response to a request from the National Personal Protective Technology Laboratory (NPPTL) at the National Institute for Occupational Safety and Health (NIOSH), the Institute of Medicine has formed a standing Committee on Personal Protective Equipment for Workplace Safety and Health. The committee provides a forum for discussion of scientific and technical issues relevant to the development, certification, deployment, and use of personal protective equipment, standards, and related systems to ensure workplace safety and health.
http://www.iom.edu/CMS/3740/29908/30073.aspx

Advanced Personal Protective Equipment Challenges in Protecting First Responders
October 16-18,2005, Blacksburg, VA
This conference was created as a forum to discuss and share information relevant to this important group. The conference consisted of a variety of workshops and presentations in the areas of disaster response and personal protective equipment.
http://www.cpe.vt.edu/appe/overview.html

NTTC Workshop on Self-Contained Self-Rescue Breathing Systems (SCSR)
June 29,2005, Beaver, WV
The SCSR workshops were conducted to solicit information from SCSR user groups and technology developers that will be considered in development of design criteria for the next-generation SCSR. The workshops covered each of the major design elements: size, amount of oxygen to be provided, weight, and other issues.
http://www.nttc.edu/clients/nioshworkshop/workshopnotes.asp

Occupational Safety and Health Administration 5600 Disaster Site Worker Train the Trainer
April 24-28,2005, Beckley, WV
Disaster site workers, Terrorism Awareness, Respiratory Protection

National Fire Protective Association Hazmat Personal Protective Equipment Technical Committee Presentation
April 17,2005, NIOSH, Pittsburgh, PA
Review of Public comments on the revision to NFPA 1994

Directions Meeting: Setting a Research Direction for the National Personal Protective Technology Laboratory
Sept 13, 2001, Pittsburgh, PA
The purpose of this meeting was to align FY2001 and FY2002 NIOSH PPT projects and stakeholder recommended programs with the PPT areas of program emphasis.

NIOSH-DOD-OSHA Sponsored Chemical and Biological Respiratory Protection Workshop
March 10-12, 1999 Lakeview Resort and Conference Center, Morgantown, WV
Provided a forum for over 140 representatives from 63 different emergency responder, fire fighter, domestic preparedness, equipment manufacturing, federal research, and state and federal regulatory organizations. Participants discussed issues, exchanged information, and learned about current respiratory protection issues associated with incidents involving chemical and biological agents.
http://www.cdc.gov/niosh/pdfs/2000-122.pdf

NIOSH Control of Workplace Hazards for the 21st Century
March 10-12, 1998 Hyatt Regency Hotel, Chicago, IL
Developed a prioritized national control technology (to include personal protective technology) research agenda aimed at making the workplace safer and healthier. In combination with the American Industrial Hygiene Association and the American Society of Safety Engineers, the NIOSH ***Control Technology and Personal Protective Equipment Team*** held a unique conference, "The Control of Workplace Hazards for the 21st Century: Setting the Research Agenda," in Chicago in March 1998. It brought together over 250 researchers, manufacturers, and users of engineering controls and personal protective equipment. At the conference, the participants set future directions for control technology research. Six priorities for research were identified: chemical protective clothing, engineering controls, noise, non-ionizing radiation, respirators, and traumatic injuries.

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List of PPT Supported Conferences, Workshops and Meetings

Appendix N lists the 24 selected Supported Conferences, Workshops and Meetings from current and former projects' activities in the PPT Program's portfolio of projects. These activities represent a sampling of activities that serve as both an input to the PPT Program and as outreach and transfer activities.

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List of PPT Supported Conferences, Workshops and Meeting

Outputs: Research to Practice

Historically, NIOSH has been a leader in applying research into workplace solutions that reduce injury and illness. Research to Practice (r2p) is a NIOSH initiative focused on the transfer and translation of research findings, technologies, and information into highly effective prevention practices and products which are adopted in the workplace.

The goal of r2p is to increase workplace use of effective NIOSH and NIOSH-funded research findings. NIOSH continues to work with our partners to focus research on ways to develop effective products, translate research findings into practice, target dissemination efforts, and evaluate and demonstrate the effectiveness of these efforts in improving worker health and safety.

Outreach Activities

NIOSH has participated in the following conferences over the past several years to disseminate NIOSH PPT information and update PPE users and stakeholders on research, certification, and standards development activities.

NIOSH Nanotech Conference
December 4-7, 2006, Cincinnati, Ohio
NIOSH information related to personal protective technology and nanotechnology.

South Park Community Day
September 23, 2006, South Park Township, Pennsylvania
Silicosis; protecting your home from hazards, needle stick.

International Society for Respiratory Protection Conference
August 27-September 1, 2006, Toronto, Ontario, Canada
Multiple presentations related to respiratory protection.

New York State Fair Exhibition
August 23-September 5, 2006, New York, New York
NIOSH and AIHA, hazards in the workplace and at home.

Firehouse Expo
July 25-30, 2006, Baltimore, Maryland
Approval, certification, evaluation, post-approval activities for respirators.

AIHce Conference and Expo
May 14-16, 2006, Chicago, Illinois
NIOSH information related to personal protective technology.

Fire Department Instructors Conference
April 25-30, 2006, Indianapolis, Indiana
NIOSH Pocket Guide.

16th Annual Construction Safety Conference and Exhibition
April 4-6, 2006, Rosemont, Illinois
Construction safety information from NIOSH.

International Association of Fire Chiefs (IAFC)
2006 Hazardous Materials Team Leaders Roundtable Meeting
April 4, 2006, Reston, Virginia
NIOSH CBRN Respirator and NFPA PPE Standards.

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List of PPT Supported Conferences, Workshops and Meeting

53rd Association of Perioperative Nurses (AORN) Conference
March 19-22, 2006, Washington, DC
NIOSH healthcare related publications.

University of Pittsburgh, Center for Emergency Medicine Tools and Talent Conference
February 3, 2006, Pittsburgh, Pennsylvania
Healthcare related publications on CD.

International Safety Equipment Association Meeting
November 17, 2005, Washington, DC
Improved Emergency Medical Service PPE Performance Criteria.

International Association of Fire Fighters (IAFF)
John P. Redmond Symposium on Occupational Health and Safety of the Fire Services
October 23, 2005, Honolulu, Hawaii
PPE Performance Criteria and Standards.

Advanced PPE: Challenges in Protecting First Responders
October 16-18, 2005, Blacksburg, Virginia
Various workshops relating to personal protective equipment.

3rd International Symposium on Nanotechnology and Occupational Health
October 5, 20005, Minneapolis, Minnesota
Respirator filter efficiency against nanoaerosols.

National Safety Congress and Expo
September 17-23, 2005, Orlando, Florida
NIOSH information related to personal protective technology.

National Response Team Safety & Health Committee Meeting
Respirator & Medical Technical Seminar
July 19, 2005, Washington, DC
PPE Performance Criteria and Standard.

American Industrial Hygiene Association Conference and Expo
June 23-27, 2005, Anaheim, California
NIOSH research and information related to facial anthropometrics.

AIHce Conference and Expo
May 21-26, 2005, Anaheim, California
First responders protection response at a tall building collapse.

52nd Association of Perioperative Nurses (AORN) Conference
April 3-7, 2005, New Orleans, Louisiana
Helping AORN members become more familiar with Perioperative Partners.

International Association of Chiefs of Police (IACP)
Homeland Security Committee Meeting
March 25, 2005, Orlando, Florida
PPE Performance Criteria and Standards.

National Demolition Association Annual Conference
March 5, 2005, Las Vegas, Nevada
Protocol for surveillance of programs using respirators in the construction industry.

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List of PPT Supported Conferences, Workshops and Meeting

4th International Conference on Safety and Protective Fabrics
October 26, 2004, Pittsburgh, Pennsylvania
Self-Decontaminating fabrics for chemical and biological protection.

Eight Symposium on Performance of Protective Clothing: Global Needs and Emerging Markets
January 13, 2004, Tampa, Florida
NIOSH research related to chemical protective clothing.

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User Notices Distributed by Year

Appendix O includes examples of Users Notices issued by the PPT Program between Fiscal Year 2001 (FY01) and Fiscal Year 2006 (FY06). User Notices are outputs of the CPIP activities and are distributed to inform potential users of corrective actions that need to be taken to resolve performance problems with NIOSH-certified respirators. User Notices issued to implement corrective actions on identified units may be issued by NIOSH, the affected respirator's manufacturer, the component manufacturer if the problem is from a component from a manufacturer other than the respirator manufacturer, or a combination of the three.

Distribution of the PPT Program User Notices are through email, internet postings on the NIOSH website, and, formerly, by mass mailings. Generally, respirator and other PPE manufacturers do not have direct and documented seller-buyer relationships with their customers, and therefore, are generally, unable to identify customers for notification at the occurrence of problems needing correction. Directed distribution of User Notices have been by email or mass mailing has been through distribution lists generated by the PPT program by offering to collect the mailing information from interested users. The PPT Program currently maintains a list serve system for distribution of User Notices to maintained lists of interested parties who have identified their area of interest for notifications. Interested parties enroll for the list serve by on-line submission of contact information on the NIOSH web page. The User Notices presented in Appendix O contain examples of the three corrective action possibilities:

(1) Affected units can be recalled from the marketplace and users (Product Recall),
(2) Affected units can be retrofitted with replacement parts that correct the performance concern (Product Retrofit), or
(3) The certification for the affected configuration can be rescinded, meaning the units manufactured under that NIOSH "license" are no longer considered to be certified respirators and can not be used as PPE in for occupational requirements of reducing worker exposures to inhalation hazards (Rescission).

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User Notices Distributed by Year

User Notices Distributed by Year (FY01 - Present)

User Notice issued by	Date	Subject / Problem	Actions	Rescinded	Recalled	Retrofit
Luxfer	14-Dec-06	Non-compliant SCBA cylinders must be tested to comply with DOT requirements	DOT retest of cylinders		x	x
NFPA	6-Dec-06	PASS alarm signals can fail at high temperatures	Advisory and testing			x
MSA	8-Nov-06	Life-Saver 60 SCSR Candle catches fire	No longer manufactured		x	
Scott Safety	30-Oct-06	Concerning Low Pressure Hoses on SCOTT® Air-Pak FiftyTM/Wireframe and NxG2 SCBA	Replace hoses by Goodyear			x
	FY07			0	2	3
NIOSH	28-Sep-06	The Mainstays Projects RSP1MS Particulate Respirator is not certified and approved by NIOSH.	Mis-labeled			x
NIOSH	30-Jun-06	NIOSH certificates of approval, TC-84A-4172 and TC-84A-4173, for the Models RPN951 and RPN952 filtering facepiece respirators are null and void.	Approval Voided	x		
NIOSH	29-Jun-06	The Nano Guard respirator is improperly labeled with the NIOSH logos. Additionally, the label contains a NIOSH approval number, TC-84A-4175, which was not issued to 2HDistributors.	Approval non existent	x		
Survivair	16-Jun-06	Survivair TwentyTwenty Plus® Facepiece nozzle has the potential to crack at the molding knit line if the Air Klic is over-tightened	Replace nozzle			x
US DOT	10-May-06	Safety Advisory Concerning the Manufacture, Marking, and Sale of Untested Compressed Gas Cylinders	Luxfer to retest cylinders			x
Survivair	3-May-06	Luxfer Gas Cylinders	Luxfer to retest cylinders			x
Survivair	2-May-06	Survivair Acid Gas, Multi-contaminant, Multi-contaminant / P100, and Hydrogen Chloride Cartridges manufactured in 2002.	Calibration of analyzer / retest			x
NIOSH	27-Apr-06	TC-13F-28 for the International Safety Device (ISD) Model 5000 Air Capsule 5-Minute Emergency Escape Breathing Apparatus has been rescinded.	Rescinded	x		
Scott Safety	20-Apr-06	Scott AV-3000 Facepieces	Replace lens frames			x
NIOSH	4-Apr-06	Rupture of Survivair Self-Contained Breathing Apparatus Cylinder Valves	Stop use and replace valve		x	x
NIOSH	17-Mar-06	Meaning of NIOSH Approvals	Information			
MSA	6-Mar-06	Users of MSA Compressed Air Cylinders	Luxfer to retest cylinders		x	x
Scott Safety	6-Mar-06	Luxfer Carbon Fiber Composite Cylinders	Luxfer to retest cylinders			x
Survivair	1-Mar-06	Survivair SCBA Cylinder Valve part numbers 921040, 921045, 961165, 921065, 920312, 920322, and 964833	Retest Valves			x
NIOSH	21-Dec-05	Revocation of Approval for Global Secure Safety (formerly Neoterik Health Technologies) CB5 Series 2600 Pressure-Demand Supplied-Air Respirator	Revoked Approval	x		
NIOSH	7-Oct-05	Improper Cylinder Requalification by All-Out Fire Equipment Co.	DOT retest of cylinders			x
	FY06			4	2	11

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User Notices Distributed by Year

User Notices Distributed by Year (FY01 - Present)

User Notice issued by	Date	Subject / Problem	Actions	Rescinded	Recalled	Retrofit
NIOSH	26-Aug-05	Approvals Revoked for Survivair - Willson Dalloz P95 filters	Revoked Approval	x		
Survivair	24-Aug-05	Recall of Willson and Survivair model P95 filter pads.	Below 95% std		x	
NIOSH	2-Aug-05	Revoked Approvals for Various Sellstrom Manufacturing Company Respirators	Revoked Approval	x		
Survivair	14-Jun-05	Pro-Tech combination vapor and/or gas cartridge with P100 filter.	Below Std / Rubber seal used		x	
	FY05			2	2	0
NIOSH	14-Nov-02	Life-Saver 60 SCSR Candle catches fire	No longer manufactured		x	
NIOSH	5-Nov-02	Potential Deterioration of Exhalation Breathing Hose on Ocenco, Incorporated EBA 6.5 Self-Contained, Self-Rescuer (SCSR	Return to Ocenco for repair		x	x
	FY03			0	2	1
NIOSH	4-Sep-02	Dust/Mist Filters Approved Under Title 30 CFR, Part 11	Replace filters to 42 CFR Part 84 std.			x
NIOSH	3-Jul-02	Approval Revoked for Wen Mask Industrial Co K4-795 N95 and KR-808 N95	Revoked Approval	x		
NIOSH	4-Mar-02	Potential Reduction to Service Life for MSA Life-Saver 60 SCSR's	Update to ESL info			x
NIOSH	25-Feb-02	Withdrawal of Aearo Company's Full Facepiece Respirators with the R59A Mercury vapor/Chlorine Cartridge	Withdrawal of approval	x		
NIOSH	4-Oct-01	Improperly Assembled Relief Valves on certain Drager OXY K Plus SCSRs	Stop use and replace		x	x
	FY02			2	1	3
NIOSH	25-Sep-01	Recall of Certain 3M Breathe Easy™ PAPR Cartridges	Stop use and return to 3M		x	
	FY01			0	1	0

FY	Rescinded	Recalled	Retrofit	# Issued
FY07	0	2	3	4
FY06	4	2	11	16
FY05	2	2	0	4
FY04	0	0	0	0
FY03	0	2	1	2
FY02	2	1	3	5
FY01	0	1	0	1

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Letters to Manufacturers

Appendix P provides a listing of PPT program letters to respirator manufacturers. These letters, listed chronologically, are typically issued by the respirator certification activity. The letters are used as a means of communicating PPT Program meeting announcements and other respirator certification announcements including new policy and policy change notices. The listing covers the period from 2001 through the present.

Letters to Manufacturers Distributed by Year (FY01 - Present)

Date	Subject	Outcome
27-Feb-07	Respirator Manufacturers Meeting April 10th, 11th, and 12th, 2007	Discuss standard test and application procedures and LTFE, etc.
8-Dec-06	NIOSH NPPTL and NFPA Joint Approval Process for NFPA 1981 2007 Edition Respirator Approvals	The combined effect of these two standards is NFPA compliance and NIOSH CBRN compliance approvals must be issued jointly.
20-Oct-06	Time extension to submit comments on the Closed-Circuit Escape Respirators (CCER) Concept Requirements	Interested persons or organizations are invited to participate in this rulemaking by submitting written views, arguments, recommendations, and data.
6-Oct-06	Voluntary Program for Acceptance of Applications for the Testing and Evaluation of Powered Air-Purifying Respirators (PAPR or PAPRS) for Use Against Chemical, Biological, Radiological and Nuclear (CBRN) Agents	To be approved for use in providing protection against CBRN agents, NIOSH has determined that a PAPR must be evaluated against the criteria defined in t Statement of Standard for Chemical, Biological, Radiological and Nuclear (CBRN) Powered Air- Purifying Respirator (PAPR) dated October 6, 2006.
6-Oct-06	CBRN Combination SCBA and CBRN Supplied Air respirator concepts	Because of the diversity of designs and configurations possible, NIOSH has decided to proceed with the process in phases rather than attempt a global change for all possible combinations and supplied air systems
2-Oct-06	NIOSH Policy for Respirator Sealing Surfaces and Facial Hair	It has been brought to the attention of NIOSH through phone calls and emails from respirator users and manufacturers that some respirator manufacturers may not understand what NIOSH defines as the sealing surface for respirators and consequently are inappropriately marketing respirators for users with facia hair.
FY 2007	**# Issued = 6**	
21-Aug-06	Closed Circuit Escape Respirator (CCER) Public Meetings	The meetings are being held to provide an opportunity for an exchange of information between NIOSH and MSHA with respirator manufacturers, industry representatives, labor representatives, and others with an interest in respiratory protection.
14-Aug-06	National Personal Protective Technology Laboratory Public Meeting	New programs for the approval of Powered, Air-Purifying Respirators (PAPRs), Total Inward Leakage (TIL), the Quality Assurance (QA) module, and the Administrative module will be discussed.
7-Aug-06	Respirator Manufacturer's Meeting, October 11, 2006	Respirator certification topics will be addressed.
15-Jun-06	Revised "Cautions & Limitations" List for CBRN Air-Purifying Respirators (APR)	The March 14, 2003 list of “Cautions & Limitations for Use” did not include the necessary code letters that are to be used.
17-Mar-06	Meaning of NIOSH Approval	A NIOSH approval applies only to the specific respirator that is made up of the components included on the NIOSH approval label.
16-Mar-06	National Institute for Occupation Safety and Health Announcement of a Public Meeting to be held on April 27, 2006, to Discuss Expediting the Respirator Certification Process, Isoamyl Acetate (IAA) Testing, N95 Filtering Facepiece Priority, CBRN NFPA 1981 Standard, and Changes to Post-Certification Audit Selection	Some topics to be addressed include user fit-test instructions, speeding up the respirator certification process, isoamyl acetate (IAA) testing, equipment malfunctions, N95 filtering facepiece priority, and CBRN NFPA 1981 Standard and changes to post-certification audit selection.

Letters to Manufacturers Distributed by Year (FY01 - Present)

Date	Subject	Outcome
16-Mar-06	Revised fees for CBRN respirator approvals, effective April 1, 2006	As a result of the most recent analysis, the fees for testing respirators providing protection against chemical, biological, radiological, and nuclear agents have been revised.
9-Jan-06	Clarification of use of manufacturer's pretest data	NPPTL staff replied that pretest data could not be used as a substitute for certification testing. NPPTL is not aware of any lack of reliability of manufacturers' pretest data in general.
15-Nov-05	The National Institute for Occupational Safety and Health (NIOSH), will hold a meeting for all respirator manufacturers on December 12, 2005, at the NIOSH site in Pittsburgh , Pennsylvania .	The morning session will address replacement rates, and alternatives to the silica dust tests for powered, air-purifying respirators (PAPRs), labeling for filtering facepiece respirators, and other topics.
15-Nov-05	National Institute for Occupational Safety and Health Public Meeting to be held on December 13, 2005, to Continue Discussions of Concepts for Standards for Approval of Respirators for Use Against Chemical, Biological, Radiological, and Nuclear Agents (CBRN) and Concepts for Standards for a Multi-Function Powered, Air-Purifying Respirator (PAPR)	The meeting will address concepts for standards for CBRN Closed-Circuit, Self-Contained Breathing Apparatus (SCBA), CBRN Powered, Air-Purifying Respirator, and a Multi-Function PAPR.
FY 2006	**# Issued = 10**	
29-Aug-05	Revocation of Cylinder Exemption DOT-E-12695	Accordingly, any respirator incorporating a cylinder manufactured under DOT-E-12695 can no longer maintain NIOSH approval.
26-Aug-05	Revised Standard Application Procedures for the Certification of Respirators	Effective July 14, 2005, NIOSH will require that each applicant who requests NIOSH certification comply with the requirements set forth in the July 2005 version of the SAP. To accommodate manufacturers who may have requests for approval underway, NIOSH will allow a six month grace period, until January 1 2006, to identify all User's Instructions on the relevant assembly matrix.
23-Jun-05	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on July 19-20, 2005, to Continue Discussions of Concepts for Standards for Approval of Respirators for Use Against Chemical, Biological, Radiological and Nuclear Agents (CBRN) and Guidelines for Their Use; and Concepts for Standards for a Multi-Function Powered Air Purifying Respirator (PAPR)	NIOSH will also introduce concepts for establishing multi-function PAPR requirements and guidelines for use of NIOSH-approved CBRN respirators.
20-May-05	Respirator Branch, is announcing a meeting for all respirator manufacturers to be held on July 21, 2005	Topics to be addressed include discussion of the Standard Application Procedures (SAP) comments, moving forward to implement the release of the procedures, new NPPTL and Respirator Branch organizational structures, and follow-up on replacement documents.
18-May-05	Air-Purifying Fit Test Subject Selection	Over the years, several issues with test subject selection during testing have emerged and been interpreted differently. Therefore, the fit test policy for air-purifying respirators is being revised to clarify the requirements for this test.

Letters to Manufacturers Distributed by Year (FY01 - Present)

Date	Subject	Outcome
22-Apr-05	Unique Part Numbers; Abbreviated Labeling Options for Cartridges and Filters	In an effort to meet the needs of the manufacturers while still maintaining the concept of only one part number for field identification and traceability, NIOSH is offering options for replaceable cartridges and filters.
7-Apr-05	Clarification of Supplier and Subcontractor Relationships	A growing number of approval holders wish to ship NIOSH-approved respirators directly from a subcontractor to distribution centers or customers, and replacement parts directly to a repair center. The Institute has identified two possible approval holder relationships with suppliers and subcontractors. Listed below are the responsibilities and requirements NIOSH has established for these relationships.
11-Mar-05	Respirator Branch, is announcing a meeting for all respirator manufacturers to be held on April 13, 2005	Topics to be addressed include discussion of the Standard Application Procedures (SAP) comments, moving forward to implement the release of the procedures, new NPPTL and Respirator Branch organizational structures, and follow-up on replacement documents.
10-Mar-05	April 1, 2005 revised fees for CBRN respirator approvals and Federal Tax ID Number - Employee Identification Number (EIN) listing on all payment checks	New fees for CBRN approvals are being implemented effective April 1, 2005 ar will be applied to all applications received on or after that date. All applications received before April 1, 2005 will be billed at the 2004 rates.
16-Nov-04	Respirator Branch, is announcing a meeting for all respirator manufacturers to be held on December 14, 2004	Topics to be addressed include new NPPTL and Respirator Branch organizational structures, availability of revised Standard Application Procedures for comment, and concepts for Respirator Branch process and procedure changes.
12-Nov-04	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on December 15, 2004	The purpose of the meeting is to continue discussions of conceptual standards and testing processes for PAPR standards suitable for respiratory protection against CBRN agents. NIOSH also wishes to introduce conceptual requiremen for Closed Circuit, Self Contained Breathing Apparatus suitable for respiratory protection against CBRN agents
FY 2005	**# Issued = 11**	
14-Jul-04	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on August 25, 2004	The purpose of the meeting is to begin initial discussions for concepts of total inward leakage (TIL) requirements and test methods for halfmask respirators including elastomeric and filtering facepiece styles.
26-Mar-04	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on May 4, 2004	The purpose of the meeting is to continue discussions of conceptual standards and testing processes for powered air-purifying respirator (PAPR) standards suitable for respiratory protection against CBRN agents.

Letters to Manufacturers Distributed by Year (FY01 - Present)

Date	Subject	Outcome
8-Oct-03	Voluntary Program for Acceptance of Applications for the Testing and Evaluation of Air-Purifying Escape Respirators and Self-Contained Escape Respirators for Use Against Chemical, Biological, Radiological and Nuclear (CBRN) Agents	It is imperative that the general working population be afforded effective respiratory protection in escaping from terrorist events involving possible chemical, biological, radiological and nuclear (CBRN) agents.
FY 2004	**# Issued = 3**	
24-Sep-03	National Institute for Occupational Safety and Health Announcement of Two Public Meetings to be held on October 16, 2003	CBRN Public Meeting and the Quality Assurance Standards Module Meeting
6-Jun-03	National Institute for Occupational Safety and Health Announcement of a Respirator Certification Process Workshop to be held on June 26, 2003	The intent of the workshop is to discuss the respirator certification process and to explore ideas and concepts for improving the process
4-Jun-03	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on June 25, 2003	The purpose of the meeting is to continue conceptual discussions of concepts being considered for CBRN Escape Respirator standards and to provide an update on the development of the Quality Assurance/Administrative module.
10-Apr-03	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on April 29, 2003	The purpose of the meeting is to continue conceptual discussions of concepts being considered for CBRN Escape Respirator standards and review research efforts to identify simulant materials for use as CBRN test surrogates for respirator research and development efforts.
4-Apr-03	Voluntary Program for Acceptance of Applications for the Testing and Evaluation of Full-Facepiece Air Purifying Respirators (APR) for Use Against Chemical, Biological, Radiological and Nuclear (CBRN) Agents	Due to ongoing concern of a potential terrorist event and the need to provide the emergency responder community with the best available respiratory protection quickly as possible
12-Mar-03	National Institute for Occupational Safety and Health Announcement of a Public Meeting to be held on April 10, 2003	The purpose of this meeting is to provide an opportunity for an exchange of information between the Agency and respirator manufacturers, industry representatives, labor representatives, and others with an interest in respiratory protection.
11-Mar-03	National Institute for Occupational Safety and Health Announcement of Public Meetings to be held on April 10, 2003, and April 24, 2003	NIOSH, in consultation with the Mine Safety and Health Administration (MSHA), is in the process of developing a proposed rule on the performance and reliabil requirements of close-circuit self-contained escape breathing apparatus.
11-Mar-03	NIOSH/NPPTL CBRN Respirator Research and Development (R&D) Test Program	The purpose of this letter is to introduce a new CBRN Respirator Research and Development Test Program.
11-Mar-03	Upgrade of Previously-Deployed SCBA Configurations to CBRN Approval Status	This letter is to inform manufacturers that NIOSH will immediately begin accepting extension of approval applications for the evaluation of components and procedures to upgrade previously-deployed (field-deployed) NIOSH-approved Self Contained Breathing Apparatus to CBRN-approved configurations.
FY 2003	**# Issued = 9**	

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Letters to Manufacturers

Letters to Manufacturers Distributed by Year (FY01 - Present)

Date	Subject	Outcome
23-Sep-02	National Institute for Occupational Safety and Health Announcement of a Public Meeting on October 16 & 17, 2002	The purpose of the meeting is to present concepts for discussing appropriate standards and testing processes for full-facepiece air-purifying respirators suitable for use by first responders against CBRN Agents; concepts and priorities for the development and implementation of standards for other classes of respirators
10-Jul-02	Relocation of NIOSH's Respirator Branch to the National Personal Protective Technology Laboratory (NPPTL)	The National Institute for Occupational Safety and Health (NIOSH) is announcing the relocation of the Respirator Branch to the National Personal Protective Technology Laboratory (NPPTL) in Bruceton, Pennsylvania, near Pittsburgh.
24-May-02	National Institute for Occupational Safety and Health Announcement of a Public Meeting on June 18-19, 2002	National Institute for Standards and Technology (NIST) is planning to conduct a public stakeholder meeting on June 18-19, 2002, to present concepts for discussing appropriate standards and testing processes for full-facepiece air-purifying respirators suitable for use by first responders against CBRN Agents
28-Dec-01	Acceptance of Applications for the Testing and Evaluation of Self-Contained Breathing Apparatus for Use Against Chemical, Biological, Radiological, and Nuclear Agents	This letter informs applicants of additional requirements that an SCBA must meet for NIOSH approval and provides the procedures for submitting applications to participate in this voluntary program.
FY 2002	**# Issued = 4**	
FY 2001	**# Issued = 0**	

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Requests for Information/Assistance

Appendix Q provides a sampling of the types of information and technical assistance requests that the PPT Program responds to regularly. Program activities vary in levels of expertise and resource expenditures by the type and complexity of the request. Requests for expert or peer review of publications and other products is an example of a specific area of requests received on a routine basis by the Program's scientists and researchers which have been excluded from this listing.

Inhalation

Mine Safety and Health Research Advisory Committee (MSHRAC), National Institute for Occupational Safety and Health, of the Department of Health and Human Services

PPT program officials report, as appropriate during regularly-scheduled committee meetings, on PPT research activities related to mine safety and health, to obtain committee advice on priorities. (annually or semi-annually).

Formal Request (June 2007, State of Virginia Department of Emergency Management)

Hazardous materials officer, Region 1, Virginia Department of Emergency Management invited PPT scientist to lecture hazardous materials responders at the upcoming Virginia Association of Hazardous Materials Response Specialists/Virginia Department of Emergency Management Hazardous Materials Conference, October 15-19, 2007, Norfolk, VA. PPT scientists and engineers accepted the invitation.

Informal Request (June 2007, Battalion Chief-Special Operations, Seminole County Fire Department, Florida)

A fire service battalion chief requested public information links concerning NIOSH CBRN respirator approvals. PPT scientists provided NIOSH electronic links to NIOSH CBRN SCBA, APR, APER and PAPR approvals.

Informal Request (June 2007, Department of Homeland Security, Federal Law Enforcement Training Center (FLETC), Glencoe, GA)

PPT scientists and engineers received a request from a senior FLETC instructor asking for sources and relevant guidance on the CDC's position concerning decontamination of CBRN agents. PPT scientists replied with source links detailing the CDC decontamination methods used in the Washington, DC, Ricin incident; NIOSH Emergency Response Cards on Mustard agent; and NIOSH CBRN SCBA and APR Cautions and Limitations related to decontamination.

Informal Request (June 2007, COBRA Awareness Unit, Special Training Section, New York Police Academy, New York City, NY (NYPD))

PPT scientists and engineers were asked user questions related to the service life of NIOSH-certified CBRN APR canisters. A timely reply was provided to NYPD with a follow up. NIOSH replies focused on validating conclusive information provided by the respirator manufacturer to NYPD and verifying the user and canister performance requirements of CBRN canister in its original manufacturer specified packaging versus the canister in a "training" configuration/open and outside of its manufacturer specified packaging.

Informal Request (June 2007 Taiwan China Medical University Department of Occupational Safety and Health

A PPT scientist was invited to give a presentation at the Taiwan China Medical University Department of Occupational Safety and Health on respirator basics, respirator

Inhalation

selection and fit-testing. The two-day presentation on June 5 and 6, 2007 was attended by 150 students, faculty, and invited guests. As a result of this presentation the PPT scientist was requested to make a presentation at the Taiwan Institute of Occupational Safety and Health on June 7, 2007 on respirator testing and certification. This request was accommodated and well received by the staff of the Institute.

Informal Request (May 2007, Department of Veteran's Affairs (VA))
PPT personnel were requested to release a summary report of the first third of an ongoing research study to the VA so that they could avoid unnecessary duplication of effort with the ongoing NIOSH/DoD research. The collaborative action provided information to another government agency prior to research study was completed and results released to the public. This is an example of the PPT program reaching out to other governmental agencies to assist in their missions.

Informal Request (May 2007, Mine Safety Appliances Company)
MSA product line manager requested PPT scientists provide formal interpretation on usage of CBRN PAPR with tight-fitting facepieces versus CBRN PAPR with loose-fitting facepieces intended for health care worker use. PPT management requested a formal letter from MSA outlining the specific inquiry in question and also provided a electronic reply directing the product manager to the NIOSH-approved CBRN PAPR interim user webpage guidance, the NIOSH Certified Equipment List (CEL) and recommendations on configuration management at the user level and NIOSH interpretation of approval holder user instructions related to use of CBRN PAPR (loose or tight-fitting facepiece configurations).

Informal Request (May 2007, United States Secret Service)
USSS asked PPT scientists to confirm that MSA and Scott (NIOSH approval holders) have recently received NIOSH approval for select CBRN PAPR systems. PPT scientists replied by providing the USSS with the NIOSH electronic website link for CBRN PAPR approvals, the NIOSH CEL link and generic NIOSH recommendations for use of manufacturer user instructions related to the emergency response use of NIOSH-certified CBRN PAPR.

Defense Threat Reduction Agency (DTRA) Chemical Biological Defense Initiative (May 2007, DTRA)
PPT scientists were requested to participate on an interagency team to evaluate proposals for CBDIF-07-PRO-14 Revolutionary Respiratory/Ocular Protection Concepts under the DTRA FY2007 CBD Extramural Broad Agency Announcement (BAA) Program.

2008-2011 Americas Initiative to Eliminate Silicosis (November 2006/May 2007, Chilean Government)
A PPT scientist was requested to participate on an international Silica Team to develop a proposed plan for respiratory protection for the Elimination of Silicosis in the Americas.

Inhalation

The WHO, PAHO, and ILO are participants with NIOSH, with an initial focus on Chile and Brazil.

Nanoscale Interdisciplinary Team (NIRT) (Carnegie Mellon University (CMU))
A PPT scientist was invited to become a member of a multi-university program funded by the National Science Foundation to use a combination of macromolecular engineering, self-assembly, and solid state chemistry to develop a new generation of well-defined nanostructured carbons for electronics. Some of the potential applications could be sensors, fabrics, and super adsorbents aside from electronic components.

Formal Request (April, 2007, CDC/NIOSH/Education and Information Division (EID) via a DOJ FBI -SWGFACT request to NIOSH EID)
NIOSH EID requested PPT scientists provide technical performance information on the subject of "non-oxidizable sorbent" identified in the NIOSH Chemical Hazard Pocket Guide as a type of respirator filtration media available to responders/users when protecting against red fuming nitric acid/nitric acid atmospheres. PPT engineers and scientists provided source information on non-oxidizable sorbents available from stakeholders that manufacturer chemical agent sampling tubes. PPT scientists confirmed that the CBRN APR, APER and PAPR canisters will protect against test representative samples of nitric acid in a laboratory environment.

Formal Request (March, 2007, National Fire Protection Association (NFPA) 472 Committee on Hazardous Material Responder Training and Accreditation)
The chair of the NFPA 472 committee invited PPT scientists to provide technical comment to the respirator use decision logic being considered for integration in the upcoming edition of the NFPA Hazardous Materials Response Handbook. PPT scientists provided extensive written comment and NFPA review of NIOSH comments is pending with expected integration in October 2007.

Request for Committee Participation for ASTM Standard for Air-Feed Suit Evaluation Requirements (March 2007, DOE/EFCOG)
PPT scientists were recruited to work with DOE and ASTM in the identification of these potential performance requirements for Air Suits.

Formal Request (January 2007, National Tactical Officers Association (NTOA) A lead tactical SCBA training instructor from the NTOA asked PPT scientists to provide cutting edge training aids and user guides for both CBRN and non-CBRN SCBA and APR law enforcement users. PPT engineers and scientists accepted the invitation and are in the formal process of submitting NIOSH numbered documents for review and publication.

Informal Request (December 2006, Royal Military College of Canada)
A PPT scientist was requested to provide information presented in a presentation at the International Convention of the International Society for Respiratory Protection in

Inhalation

Toronto for use in development of a new standard, DO29R "Protecting the First Responder Against CB Threats."

Informal Request (October 2006, CFIOSH (GB))
A request was made of a PPT scientist to provide more insight and information on the accuracy of Body Mass Index in determining overweight and obese states in muscular individuals. The scientist was asked to provide a more definitive response than provided in a peer-reviewed article he had authored which was published in the International Society for Respiratory Protection Journal.

Informal Request (October 2006, Med Dir W NY Poison Control Center)
A PPT scientist was requested regarding recommended respiratory protective equipment in the event of a pandemic flu outbreak. The Poison Center serves as a resource for area hospitals and municipal services (e.g., EMS, fire, police, etc.) in the region (e.g., Rochester, Buffalo, etc.).

Informal Request (October 2006, University of Cincinnati)
A PPT researcher was asked to serve on the external advisory board and collaborate on a research team in recognition of his expertise in evaluating the performance of respirators in field settings. The research study's pilot data on the WPF on biological particles were presented at the 2005 AIHCE conference and the subsequently published article by Lee et al. (JOEH, 2:577-585, 2005) was awarded the AIHA 2005 John M. White Award for research on respiratory protection. This paper presents very intriguing results on the difference in the WPF data between biological and non-biological particles.

Occupational Health and Safety Seminar in Chile (September 2006, Mutual – Chile)
A member of the PPT staff was requested to make a presentation on trends in analyzing task and control measures in manufacturing industries, particularly SME and the American approach to selection and use of PPE.

Informal Request (September 2006, Chilean Institute of Public Health)
A member of the PPT staff was requested to present information on the use of the PortaCount instrument in fit-testing respirators. The PPT representative provided testing protocols for use with the PortaCount and provided informational resources such as various websites related to Standard Test Procedures, Respirator User Notices, Letters to Manufacturers, and fit-testing.

Informal Request (September 2006, AIHA)
Two PPT scientists were requested to take part on a roundtable teleconferenced training course conducted by the AIHA conducted on September 27, 2006. This presentation was broadcast to 296 members at 73 sites.

Inhalation

Formal Request (August 2006, United States Secret Service (USSS), Department of the Treasury)
A technical security division specialist from the USSS asked PPT scientists to elaborate on what specific toxic industrial compounds (TIC) NIOSH uses to test CBRN air-purifying respirators and to provide a courtesy review of USSS Project Hammer respirators for compliance to NIOSH CBRN respirator standards and certification promulgation. PPT scientists and engineers accepted the USSS invitation to visit NIOSH in Pittsburgh and a detailed list of open-source respirator technology topics covering TIC and approval compliance was provided to the USSS. The USSS in return hosted a joint NIOSH, US ARMY, Natick, and Orange County Sheriff's Department visit to the USSS facility in Washington, DC. PPT scientists provided a courtesy technical review of all available respirators and protective ensembles used by the U.S. Secret Service in support of protecting presidential security details from chemical, biological, radiological, or nuclear agent effects.

Informal Request (July 2006, Massachusetts state firefighting academy)
PPT scientists were questioned in the selection criteria and applicability of powered air purifying respirators (PAPRs) as escape respirators. A reply explained that different PAPRs have different features and that some (those with a tight-fitting neck dam that had undergone fit-testing) could be so used. References from specific documents and websites that clearly outlined the respiratory equipment selection logic were given.

Request for Technical Presentation (July 2006, Richmond, VA)
A PPT scientist presented "NIOSH Respirator (CBRN) Standards Development" at the Fourth Annual TICs and TIMs Symposium. The information was presented to a group of 48 scientific experts and first responders. The purpose of this symposium is to provide government agencies and industry with the latest information on toxic industrial chemical response strategies and tools and to present the latest results from the research community as it continues to further our understanding of the TIC threat and improved responses, and to provide a forum for interaction among the DOD and First Response community and tool developers, and to foster interaction between the many government agencies now dealing with the TIC threat.

Formal Request (August 2006, U.S. Department of Transportation: Office of Hazardous Materials Initiatives and Training, PHMSA, DOT)
PPT scientists and engineers were invited by the DOT to comment on the Emergency Response Guide 2004 (ERG 2004) for the purposes of updating the ERG 2004 to the next edition (ERG 2008). On June 8, 2007, Mike Cloutier and George Cushmac, lead authors of the ERG 2008, contacted PPT scientists to confirm NIOSH comments submitted on September 15, 2006. PPT scientists confirmed the comments and are currently working with DOT to finalize CBRN respirator terminology in the pending ERG 2008 due out on or around January, 2008.

Inhalation

Presentations on Respiratory Standards Development, Participation on Consensus Standards Committees, and Personal Protective Technology Review (July 2006, Health & Safety Advisor, Department for Communities and Local Government, Fire & Resilience Directorate, London, UK. United Kingdom – Fire & Resilience Directorate)

PPT subject matter experts were solicited to present information on Respiratory Standards Development, Participation on Consensus Standards Committees, and Personal Protective Technology Review as a precursor for future interactions and information sharing between this UK Directorate and NIOSH in development of standards for public safety and emergency responders.

Request for Subject Matter Expertise Availability (March – June 2006, MSHA)

In the aftermath of the Sago, Alma, and Darby mine disasters, PPT scientists were recruited based on specialized knowledge, to assist MSHA in their investigations, as well as providing technical expertise to stakeholders (including NMA/BCOA/UMWA), at MSHA Public Meeting on proposed Emergency Temporary Standard (ETS), Charleston, WV and an international workshop arranged by WV Governor's Office and NIOSH, WV Governor's Taskforce on Mine Emergencies. Investigations involved SCSR performance and the design of underground refuge chambers. The MINER Act and MSHA's PPL dealing with implementation will impact NPPTL's long-standing involvement in SCSR issues, as well as the development of new technology

Stakeholder meeting for a strategy for a national survey of PPE use by women (June 2006, NIOSH/DART)

PPT personnel were requested to attend as well as identify appropriate contacts for external stakeholders including public safety, emergency response, professional, and labor organizations, and associations to participate in this activity.

Emergency Responder Interactive Response Training Program, Department of Homeland Security (DHS) Office for Grants & Training with Dartmouth College Interactive Media Laboratory (July 2006, Director of the Dartmouth College - Interactive Media Laboratory)

PPT scientists provided updated and accurate selection, performance, and certification standards (NIOSH & NFPA) information related to respiratory protection and protective ensembles Personal Protective Equipment for correction of video training tool.

Business Match Making Workshop, Regional Learning Center, Cranberry Township, PA (June 2006, Congresswoman, Melissa Hart, and the Small Business Administration)

The PPT program requested to participate in Business Match Making Workshop with Congresswoman Melissa Hart and the Small Business Administration to facilitate involvement of small businesses in transferring first responder needs and requirements to innovative PPT products.

Inhalation

Request for Technical Presentation (May 2006, ORC Worldwide)
A PPT subject matter expert was requested to provide a technical presentation on the mathematical modeling and sensor development for end-of-service-life measurement tools. The audience consisted of approximately 80 corporate safety and health professionals.

New England Consortium (NTEC), (May 2006, The New England Consortium – Advisory Board)
A PPT scientist participated to share information for inclusion in TNEC training courses on selection and use of inhalation and dermal protective equipment, OSHA 1910.34 respiratory protection standard, NIOSH 42CFR84 respirator standard, and NIOSH CBRN respirator standards. Selection and use training for hazmat protective ensembles related to NFPA standards is also included.

Project Review Subject Matter Expertise (April 2006, Department of Homeland Security and DoD, Technical Support Working Group (TSWG))
Subject matter experts in closed circuit breathing apparatus technology participated in a meeting at Essex PB&R Corporation, St. Louis, MO. The meeting was attended to review DHS funded Essex rebreather to provide technical consultation, oversight, and direction to research and product development in a DHS-funded research program.

Informal Request (December 2005, DoD/Optimetrics)
A request was made for a PPT scientist to perform a literature search regarding quantitative data from decontamination studies of toxic industrial chemicals. A quality review was required for it, incorporating the data into a computerized modeling program that will allow OptiMetrics to determine levels of toxic industrial chemicals that might be deposited in Emergency Departments by victims who are not decontaminated.

Request for Subject Matter Expert for Peer-Reviewer (May 2005, Editor-in-chief of Journal of Occupational and Environmental Hygiene)
A PPT subject matter expert was recruited to provide a peer review of a manuscript "Performance while wearing full-facepiece respirators with various combinations of inhalation and exhalation resistances." The study found significant reduction in performance time and rating as inhalation increased. The exhalation resistance levels used in the study did not affect the performance statistically. Various relationships were established such as relationship between performance time and work of breathing and relationship between performance time and inhalation resistance.

Request for Technical Presentation (September 2003, Chicago, IL)
A PPT scientist presented "Introduction to Factors in Selecting an Appropriate Respirator" and "Introduction to Respirator Basics" to more than 100 clinical toxicologists at the North American Congress of Clinical Toxicologists, Chicago Illinois, September 6, 2003.

Inhalation

Request for Technical Presentation (July 2003, Cincinnati, OH)
A PPT scientist presented "Inhalational Anthrax: Risk Assessment Perspectives" at the 2003 Ohio Chapter Society for Risk Analysis Annual Symposium: Cincinnati, in Cincinnati Ohio to 75 risk assessment specialists in July 29, 2003.

Request by DoD for Training Expertise (July 2002, CHPPM Edgewood, APG, MD
PPT personnel were requested to provide an Industrial Hygiene training course on the NIOSH/NPPTL CBRN SCBA program, its origins, its status, and its integration with facilities at the Edgewood Area.

Dermal

Mine Safety and Health Research Advisory Committee (MSHRAC), National Institute for Occupational Safety and Health, of the Department of Health and Human Services

PPT program officials reported, as appropriate during regularly-scheduled committee meetings, on PPT research activities related to mine safety and health, to obtain committee advice on priorities (annually or semi-annually).

Informal Request (May 2007, Department of Defense (DoD))

Additional information was requested from PPT staff concerning the calculations performed by the Permeation Calculator developed by PPT program staff. Experimenter bias and possible calculation errors are avoided when the normalized breakthrough time is determined for chemical protective clothing (CPC) permeation parameters with this software. The program imports data and then calculates the permeation parameters, avoiding possible errors from the use of polynomial curve fitting, polynomial derivatives, and quadratic equations.

CBT-08-PRO-07 Protective Fabric System Model – contract proposal review (May 2007, Defense Threat Reduction Agency (DTRA) Chemical Biological Defense Initiative)

A PPT scientist provided technical review and rating of proposals under the DTRA FY2007 CBD Extramural Broad Agency Announcement (BAA) Program.

Informal Request (December 2006, Dir. Opn Spt & Analysis - Tex-Shield)

Provided information on the current and proposed NFPA Standards with optional CBRN protection and detailed the similarities and differences between the NFPA Classes and OSHA Levels.

“Firefighter Thermal Exposure Warning System” (September 2006, Georgia Tech University)

PPT scientists were solicited to submit a topic for a senior engineering design project. Technical assistance and guidance requested for the team choosing to work on the research project to design a thermal heat-sensing prototype system that will determine the thermal loading in protective apparel of firefighters and produce a warning for firefighters with a visual and/or auditory cue to retreat, thereby enabling them to better avoid injury.

Emergency Responder Interactive Response Training Program, Department of Homeland Security (DHS) Office for Grants & Training with Dartmouth College Interactive Media Laboratory (July 2006, Director of the Dartmouth College - Interactive Media Laboratory)

PPT scientists provided updated and accurate selection, performance and certification standards (NIOSH & NFPA) information related to respiratory protection and protective ensembles Personal Protective Equipment (PPE) for correction of video training tool.

Dermal

Business Match Making Workshop, Regional Learning Center, Cranberry Township, PA (June 2006, Congresswoman, Melissa Hart, and the Small Business Administration)
PPT program requested to participate in Business Match Making Workshop with Congresswoman Melissa Hart and the Small Business Administration to facilitate involvement of small businesses in transferring first responder needs and requirements to innovative PPT products.

Stakeholder meeting for a strategy for a national survey of PPE use by women (June 2006, NIOSH/DART)
PPT personnel were requested to attend as well as identify appropriate contacts for external stakeholders including public safety, emergency response, professional and labor organizations, and associations to participate in this activity.

New England Consortium (NTEC), (May 2006, The New England Consortium – Advisory Board)
A PPT scientist participated to share information for inclusion in TNEC training courses on selection and use of inhalation and dermal protective equipment, OSHA 1910.34 respiratory protection standard, NIOSH 42CFR84 respirator standard, and NIOSH CBRN respirator standards. Selection and use training for hazmat protective ensembles related to NFPA standards is also included.

Homeland Security Advanced Research Projects Agency (HSARPA) (January 2006, Department of Homeland Security (DHS))
PPT scientists were requested to participate on an interagency team to evaluate responses to a Broad Agency Announcement to determine which of the responses would be rated as deserving to be invited to submit full proposals based on an evaluation that determined they offered the most promising chance of success.

Request for Technical Presentation (June 2005, Stockholm, Sweden)
A PPT scientist presented "A Skin Notation, Past Present and Future" at the International Conference on Exposure of the Skin to Chemicals, Stockholm, Sweden; June 12 – 15, 2005 in the Conference Center at the Karolinska Institute. This conference was attended by more than 200 scientists interested in dermal exposures.

Request for Technical Presentation (May 2003, Dallas, TX)
A team of PPT scientists presented a poster on “Evaluating Dermal Exposure Hazards for Assignment of Skin Notations” at the American Industrial Hygiene Conference and Exposition, Dallas Texas. May 11, 2003. This was awarded Best Risk Assessment Poster.

Injury

Mine Safety and Health Research Advisory Committee (MSHRAC), National Institute for Occupational Safety and Health, of the Department of Health and Human Services

PPT program officials reported, as appropriate during regularly-scheduled committee meetings, on PPT research activities related to mine safety and health, to obtain committee advice on priorities (annually or semi-annually).

Request for Technical Presentation (October 2007, Institute of Electrical and Electronics Engineers (IEEE) Industry Applications Society Annual Meeting, New Orleans)

PPT researcher presenting a research paper concerning the visual performance advantages of light-emitting diode cap lamps in comparison to incandescent cap lamps for the detection of slip/trip/fall hazards in a coal mine.

Serve as Chairperson for the thematic poster session at the annual meeting of the American College of Sports Medicine (ACSM) in New Orleans, LA (May 30-June 2, 2007, Program Committee of the ACSM)

A PPT scientist was recruited to be a Session Chair as well as present a poster session on "Factors which Influence Health and Performance of Firefighters and Military Personnel." The thematic poster session was a featured scientific session at the annual meeting of the ACSM in New Orleans, LA, May 30-June 2, 2007

Defense Threat Reduction Agency (DTRA) Chemical Biological Defense Initiative (May 2007, DTRA)

PPT scientists were requested to participate on an interagency team to evaluate proposals for CBDIF-07-PRO-14 Revolutionary Respiratory/Ocular Protection Concepts under the DTRA FY2007 CBD Extramural Broad Agency Announcement (BAA) Program.

Informal Request (May 2007, Department of Veteran's Affairs (VA))

PPT personnel were requested to release a summary report of the first third of an ongoing research study to the VA so that they could avoid unnecessary duplication of effort with the ongoing NIOSH/DoD research. The collaborative action provided information to another government agency prior to completion of the research study and results were released to the public. This is an example of the PPT program reaching out to other governmental agencies to assist in their missions.

Request for Technical Presentation (April 2007, Chile)

A PPT researcher was formally invited to give lectures at two of Chile's leading universities: the Technical University Federico Santa Maria, Valparaiso, Chile and the Universidad de Concepcion, Concepcion, Chile. The lectures concerned visual performance advantages of light-emitting diode cap lamps to detect mining hazards.

Injury

Informal Request (December 2006,PPE Section of Health & Safety Lab (UK))
PPT scientists were requested to provide information regarding the selection and purchase of a metabolic simulator and research uses for the metabolic simulator in various research scenarios sponsored by NIOSH and NORA.

Informal Request (December 2006, Fairfax, VA Fire Dept)
A member of the PPT staff provided an overview of the research activities of the Research Physiology Laboratory, and first responder focus of research initiatives.

"Hazardous Biochemical Detector" (September 2006, Georgia Tech)
PPT scientists were solicited to submit recommended topics for senior engineering design projects. Both technical assistance and guidance were requested and provided to the team choosing to work on the research project. The team investigated wearable technology to detect environmental biochemical parameters (toxic gases, bad air, etc.) that helps the workers take steps toward preventing work-related injuries to their safety and health.

Emergency Responder Interactive Response Training Program, Department of Homeland Security (DHS) Office for Grants & Training with Dartmouth College Interactive Media Laboratory (July 2006, Director of the Dartmouth College - Interactive Media Laboratory)
PPT scientists provided updated and accurate selection, performance, and certification standards (NIOSH & NFPA) information related to respiratory protection and protective ensembles Personal Protective Equipment (PPE) for correction of video training tool.

Business Match Making Workshop, Regional Learning Center, Cranberry Township, PA (June 2006, Congresswoman, Melissa Hart, and the Small Business Administration)
PPT program requested to participate in Business Match Making Workshop with Congresswoman Melissa Hart and the Small Business Administration to facilitate involvement of small businesses in transferring first responder needs and requirements to innovative PPT products.

Stakeholder meeting for a strategy for a national survey of PPE use by women (June 2006, NIOSH/DART)
PPT personnel were requested to attend as well as identify appropriate contacts for external stakeholders including public safety, emergency response, professional and labor organizations and associations to participate in this activity.

Fall Protection Standard Committee Service
A PPT scientist has served on the U.S. Technical Advisory Group for Personal Equipment for Protection against Falls (TC94/SC4), Delegation to the International Organization for Standardization (ISO) since 1999.

Keynote Speaker on Falls Prevention

Injury

A PPT scientist delivered a keynote speech on falls prevention for the Slip, Trip, and Fall Symposium at the Ergonomics Society annual conference (UK) in 2005.

Coordinator and Session Chair for Safety and Biomechanical Modeling
A PPT scientist has served as a coordinator and session chair on safety and biomechanics for the Digital Human Modeling for Design and Engineering Conference and Exposition since year 2000.

Editorial and Scientific Consultation
A PPT scientist has served as an editorial board member for the *Safety Science, Applied Ergonomics, and International Journal of Industrial Ergonomics* journals since 1999, and has served on the Research Committee board for grants and fellowships review for the American Society of Safety Engineers Foundation (ASSEF) since 2004.

Distinguished Research Awards
A PPT scientist has received the prestigious International Ergonomics Association (IEA) Liberty Mutual Prize (2002), National Occupational Research Agenda Partnering Award (2003), NIOSH Alice Hamilton Award (2006), and NIOSH Bullard-Sherwood r2p Transfer of Knowledge Award (2006).

Distinguished Honor
A PPT scientist has been named Fellow of the Ergonomics Society (UK) (2004) and Honorary Fellow of the Human Factors and Ergonomics Society (2005).

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Demonstrations of Stakeholder Use

Appendix R contains a selected listing of internet web site links maintained by private sector and public sector entities that reference products and/or services having a direct connection to the NIOSH PPT Program's outputs and outcomes. The listing demonstrates the impact made in the Respiratory Protection area (Inhalation Exposure). This listing demonstrates the impact of the program, with an emphasis in the most recent protection, that of Chemical, Biological, Radiological and Nuclear (CBRN).

Organization / Topic	CBRN Standards	Remarks
Approved Gas Masks.com Respiratory Protection Chart	http://approvedgasmasks.com/msa-filters.htm	Canisters are matched to respirator models and hazards.
Congressional Committee on Science, page 228	http://commdocs.house.gov/committees/science/hsy98563.000/hsy98563_0.HTM	Supported the development of a number of respiratory standards … adopted by DHS in February 2004.
Fire Apparatus and Emergency Equipment Magazine	http://www.fireapparatusmagazine.com/column_6.html	The overall mission of the initiatives is to help meet the United States Fire Administration's goal of reducing firefighter fatalities b 25% in 5 years and 50 % in 10 years.
Fire Chief	http://firechief.com/mag/firefighting_deep_breaths/	Test criteria have been established to assess the extent that chemical, biological, radiological or nuclear agents can penetrate o permeate through the SCBA's manufacturing materials.
NIST	http://www.eeel.nist.gov/oles/critical_incident.html	This project enhances public safety by promulgating standards for CBRNE protective equipment that ensure minimum performance, quality, and reliability.
Office of Hazardous Materials Safety	http://hazmat.dot.gov/regs/notices/rulemake.htm	Through this page OHMS provides a listing of recently published final rules, notice of proposed rulemaking, advanced notice of proposed rulemaking, and other notices published in the Federal Register.
Watson Chapel Fire Department	http://www.watsonchapelfire.com/sops.htm	The purpose of the Personnel Policy and Standard Operating Procedures Manual is to establish policy for the day-to-day operations and emergency response to incidents of the Watson Chapel Fire Department.
NFPA National Fire Protection Association	http://www.nfpa.org/index.asp?cookie%5Ftest=1	Requires use of NIOSH-approved respirators. NFPA 1981 Standard requires all NFPA-certified to have NIOSH CBRN certification.
Organization / Topic	**Manufacturers / Where to Purchase CBRN Equip**	**Remarks**
3M Gas Mask Canister FR-15-CBRN	http://survivalsolution.shopcheckout.com/mask-canister-fr15cbrn-p-127.html?osCsid=e4c55bfd37baa888f8b353b58628bcb6	This canister is designed for first responder applications commonly found in law enforcement, fire and emergency response (paramedics') environments.
All Hands Fire Equipment	http://www.allhandsfire.com/page/AHF/CTGY/scba_cylinders	SCBA Cylinder Sales
Approved Gas Masks.com	http://approvedgasmasks.com/resources.htm	We beat ALL prices from legitimate gas mask dealers.
Brigham Industries, Inc	http://www.brighamindustries.com/	Brigham Industries is dedicated to offering the emergency service community products and services that will help them save lives.
Dalmation Fire Equipment, Inc	http://www.dalmatianfire.com/component/option.com_phpshop/page,shop.browse/category_id,40/	Since 1995, DALMATIAN has served the Oilfield Safety and Fire Fighting sector with high-quality products and unbeatable prices.
Grayling Wireless U.S.A.	http://www.barrowstreet.com/Clients/report/grayling_wireless_u.htm	Grayling's flagship radio communications product is called ClearCalm™ Advantage-S, which is a hands-free, wireless, voice-activated communications system that works with a Self-Contained Breathing Apparatus (SCBA).
Metro Fire Quality Fire Fighting Equipment	http://www.metro-fire.net/resources/documents.php	Metro Fire is the premiere provider of firefighting equipment and supplies.

Organization / Topic	Manufacturers / Where to Purchase CBRN Equip	Remarks
Purchasing a Gas Mask; Choose Wisely	http://www.warriormindset.com/Articles/article-mask1.htm	NIOSH is in the vanguard for inspecting the numerous respirators and determining which are safe in a Weapons of Mass Destruction environment for civilian responders.
Respirators Inc.	http://respirators.us/press.php	A distributor of N95 and N100 respirators has expanded its produc offerings to accommodate customer requests relating to the avian bird flu concerns.
Rutledge Respiratory Protection	http://www.rutledgeh2s.com/scott/self-contained.htm	Rutledge has proven to be the trusted name in World H2S safety with an unblemished record since its establishment in 1981.
Survival Solution	http://survivalsolution.shopcheckout.com/directbuy.php?osCsid=192 6daa79e66b5a1a65d5d5484b000c	Survival Solution offers the latest products of the highest quality fo emergency, disaster, and survival situations.
The U.S. Market for Personal Protective Gear	http://www.sbireports.com/product/print.asp?productid=1097895	SBI estimates the market for personal protective gear in the U.S. at $2.9 billion, with the major end-user market for protective gear in the manufacturing, construction, transport and utilities, and public safety segments.
Volunteer Firefighting Product Categories	http://www.firerescue1.com/volunteerfd/products/press-releases/	Welcome to VolunteerFD.org, the top location for the exchange of ideas and insight among volunteer firefighters from across North America.
Organization / Topic	**Applying for Funds / Grants / Purchase Contracts**	**Remarks**
CHIEF	http://www.chiefsupply.com/grants/testimonials.asp	Public Safety Grants Consulting
City of Enid, OK	http://www.enid.org/fire/services/maintenance.htm	The Maintenance Division also assists with the preparation of new apparatus bid specifications for the Department.
City of Tulsa, OK	http://www.cityoftulsapurchasing.org/HISSPECAWA1999.HTML	History of Specifications, Bid Summaries, and Awards 1999
City Wanted & For Sale Ads	http://www.lmnc.org/cities/muniads.cfm	Advertise wanted, for sale items online and in Cities Bulletin newsletter
PA Bulletin Department of General Services	http://www.pabulletin.com/secure/data/vol30/30-13/state_contract.html	STATE CONTRACTS INFORMATION DEPARTMENT OF GENERAL SERVICES
Scott Health and Safety	http://www.scotthealthsafety.com/femagrant.htm	This guide has been prepared to help your department seek funding under the U.S. Fire Administrations Assistance to Firefighters Gra Program.
State of CA, Procurement Division	http://newpdrox.dgs.ca.gov/pin/html/1-07-42-04.htm	State of California SCBA purchase contract
Washington County Fire and Rescue Association	http://www.wcvfr.org/asmin02.htm	Meeting minutes

Organization / Topic	Counter-Terrorism Training, Equipment and Information	Remarks
A Resource Guide to Law Enforcement, Corrections, and Forensic Technologies	http://www.ncjrs.gov/txtfiles1/nij/186822.txt	Subject: police planning and management, funding resources, information systems.
Counter Terrorism Resources	http://www.investigativetechnology.net/id76.html	CD-ROM Document Library contains 385 books, reports, photos, videos and documents totaling 35,116 pages.
Counter-Terrorism Training and Resources for Law Enforcement	http://www.counterterrorismtraining.gov/equip/index.html	Information on the latest equipment, procurement opportunities, technology, and standards can help you assess and acquire equipment appropriate for your agency's needs and its counter-terrorism strategy.
Fire Training & Emergency Response by: STEPHEN C. LANE	http://members.aol.com/Laneconsulting/page1.html	The following types of services are available to clients to aid in program design and implementation: 1. Program Audits, 2. Fire Protection Training, 3. Emergency Response, 4. Hazardous Materials, 5. Special Programs and Manuals, 6. Special Services.
Law Enforcement Consulting	http://www.lawenforcementconsulting.com/products-reviewed.htm	Independent law enforcement product research and review
The Delaware County Emergency Services Training Center	http://www.delcoestc.org/fall99.htm	The mission of the ESTC is to train the Emergency Services of Delaware County so that they are prepared to do their job in any situation they face.
U.S. Department Of Justice Office Of Community Oriented Policing Services	http://www.cops.usdoj.gov/txt/publications/e05031969.txt	Hazardous waste removal, transportation, and storage
US Firefighters	http://usfirefighters.net/b2log/index.php?blog=2&m=200703	Firefighter/firefighting blog with photos and more from all 50 states.
Vista Continuing Education	http://www.getceusnow.com/portal/file/bioterrorism1.htm	Bioterrorism course
Waterloo Fire and Rescue	http://www.cedarnet.org/hmrtc/terror.html	Terrorism training presentation
Organization / Topic	**Users Respiratory Protection Programs**	**Remarks**
The Catholic University of America Washington, DC 20064	http://ehs.cua.edu/manuals/environmental/8_10_Respiratory.cfm	This program provides a SOP for the safe use of respiratory protective equipment and is to be observed by all CUA Faculty, Staff and Students.
The University of Montana	http://www.umt.edu/research/Eh/pdf/RESPRO.doc	Respiratory Protection Program SOP
Ohio State University	http://chemistry.osu.edu/ehs/pdf/genericchp.pdf	University Chemical Hygiene Plan
University of CA at Berkeley	DRAFT 5/15/07 Nanotechnology: Guidelines for Safe Research Practices Introduction	Berkeley recommended a requirement that when work occurred outside of a ventilated area with nanomaterials that could become airborne, a respirator be worn with NIOSH-approved cartridges tha filter particles (N100 filters approved by NIOSH are more than 99.97% efficient for particles).
University of Wisconsin	http://www.slh.wisc.edu/wocp/documents/0134RespProtectionGeneralWP_000.pdf	Sample respiratory protection written program for general use of ai purifying respirators
Stanford University	http://www.stanford.edu/dept/EHS/prod/mainrencon/occhealth/respiratory_protection_program.pdf	Respiratory Protection Program SOP

Organization / Topic	Users Respiratory Protection Programs	Remarks
Brown University	http://www.brown.edu/Administration/EHS/training/resp_training.htm	Respiratory Protection Training : Any employee who is required to use a respirator in the workplace must attend this session.
Oregon University	http://policies.uoregon.edu/ch8respiratoryprotectionprogram.html	Policy Statement: To establish the procedures and requirements necessary for the protection of all employees and students from respiratory hazards.
The University of North Carolina at Chapel Hill	http://ehs.unc.edu/manuals/ehsmanual/4-18.html	Program describes policy and procedures for the use of respirators to protect the health of employees in accordance with OSHA 1910.134.
The American Institute for Conservation of Historic & Artistic Works	http://aic.stanford.edu/health/guides/guide1_1.html	The Health and Safety Committee has compiled resources related t regulatory, research, and toxicological information that we believe conservators will find useful in their work.
Vanderbilt University	http://www.safety.vanderbilt.edu/resources/flos_osha_respiratory.htm	VEHS is responsible for the development, implementation, and administration of Vanderbilt University's Respiratory Protection Program.
The University of Chicago	http://safety.uchicago.edu/3_6.html	No employee of the University of Chicago shall be issued or required to wear a respirator until the need for such protection is validated by Safety and Environmental Affairs and the affected employee has met the criteria set forth by OSHA.
University Of Louisville	http://louisville.edu/admin/dehs/RPP/respiratoryprogram.htm	University of Louisville Respiratory Protection Program
Radford University	http://www.radford.edu/fpc/Safety/ppe/r_p.htm	When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators must be used.
The University of Mary Washington	http://www.umw.edu/safety/safety_plan/chapter_18_respiratory_pro.php	Respiratory Protection Program
The University of Rochester	http://www.safety.rochester.edu/ih/respprogram.html	Respiratory Protection Program
Old Dominion University	http://www.odu.edu/af/ehs/training.html	Training courses & information
University of New Mexico	http://www.unm.edu/~sheaweb/sheamanual/gensfty/21906links.htm	The program ensures those personnel required to wear respiratory protection are medically cleared, trained, and fit-tested with the proper respirators.
Southwest Texas State University	http://www.vpfss.txstate.edu/FSSPolicies/04_05_03.htm	Respiratory Protection Program
Ball Aerospace & Technologies Corp. Boulder, CO 80301	http://www.ballaerospace.com/	Use only in a well-ventilated area or wear a NIOSH-certified respirator.
Baroid Drilling Fluids Houston, TX 77251	http://www.ditchwitch.com/dwcom/index.jsp	Wear a NIOSH-certified, European Standard EN 149 or equivalent respirator when using this product.
Alliance for the Polyurethanes Industry	http://www.polyurethane.org/s_api/index.asp	The revised standard allows for the use of air-purifying respirators equipped with an end-of-service life indicator (ESLI) certified by NIOSH.
Fairfax County Professional Fire Fighters & Paramedics	http://www.fairfaxfirefighters.org/	SCBA shall be NIOSH-certified.
Safety-Kleen Systems, Inc. Plano, Texas 75024	http://www.safety-kleen.com/SKInternet/SKHome.aspx?channelid=298aafcfbd6ed010VgnVCM1000001203200aRCRD	Use NIOSH-certified, air-supplier respirators (self-contained breathing apparatus or air-line) where concentrations of methanol exceed applicable exposure limits.

Organization / Topic	Users Respiratory Protection Programs	Remarks
National Park Service Hazardous Waste Management & Pollution Prevention Team	http://www.nps.gov/	Respirators must be NIOSH-certified.
Thermal Ceramics Inc. Augusta, GA 30903-0923	http://www.thermalceramics.com/	Monitor for airborne fibers and respirable cristobalite concentrations using NIOSH method 7400(B) and 7500 respectively.
Excalibar Minerals Inc. Houston, TX 77090	http://www.excalibar.com/	Wear a NIOSH-certified, European Standard En 149 respirator when using this product.
Unifrax Corporation Niagara Falls, NY 14305-2413	http://www.unifrax.com/index.html	Half-face, air purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge.
Hillyard, Inc. St. Joseph, MO 64502	http://www.hillyard.com/	If hydrogen peroxide is leaking, wear full protective clothing and NIOSH-certified breathing apparatus.
BASF Corporation Florham Park, NJ 07932	http://www.corporate.basf.com/en/?id=V00-0em3oAAGubcp1gN	Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator. Wear NIOSH-certified chemical goggles.
United Coatings Manufacturing Co. Spokane Valley, WA 99016-9423	http://www.unitedcoatings.com/	Do not enter any enclosed or confined space without full protective equipment, including self-contained breathing apparatus (pressure-demand OSHA/NIOSH approved)…
LubLine Corp Houston, TX 77060	http://www.lubline.com/	NIOSH-certified purifying respirator with Type 95 (R or P) particulate filter may be used under conditions where airborne concentrations are expected to exceed exposure limits.
Genesis Coatings Vista, CA 92081	http://www.genesiscoatings.com/	A NIOSH-certified End of Service Life Indicator or a change schedule based upon objective information or data is used to ensure that cartridges are replaced before the end of their service life.
Aquarium Pharmaceuticals Incorporated Chalfont, PA 18914-0218	http://www.aquariumpharm.com/	Use appropriate NIOSH-certified respirator based on informed professional judgment.
Mykrolis Corporation Billerica, MA 01821	http://www.mykrolis.com/	Wear NIOSH-certified positive-pressure self-contained breathing apparatus and protective clothing as specified in 29 CFR 1910, Subpart I.
Ontario Ministry of Labour	http://www.labour.gov.on.ca/	After May 10, 1999 inspectors will issue orders under clause 25(2)(h) of the Occupational Health and Safety Act to require the new respirators or filters.
American Lung Association	http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=22542	Health care workers entering such a room must wear a respirator that has been NIOSH-certified.
International Kitchen Exhaust Cleaning Association Rockville, MD 20852	http://www.ikeca.org/	At a minimum, this documentation should include date, respirator wearer's name, title, respirator manufacturer and model, respirator size, and the National Institute for Occupational Safety and Health (NIOSH) approval number.
North American Insulation Manufacturers Association Alexandria, VA 22314	http://www.naima.org/	…must always wear a NIOSH-certified dust respirator (certified N95 or greater).
Planter Technology Hayward, CA 94544	http://www.plantertechnology.com/	In restricted areas with poor ventilation, wear a NIOSH-certified organic vapor cartridge.

Organization / Topic	Users Respiratory Protection Programs	Remarks
Anco Products, Inc. Elkhart, IN 46517	http://www.ancoproductsinc.com/	Anco recommends the use of a NIOSH-certified respirator approved for nuisance dusts when installing these products.
British Standards Institute	http://www.bsonline.bsi-global.com/server/index.jsp	The British Standards Institute has contacted NPPTL to discuss the potential inclusion of NIOSH CBRN respirator standard requirements into the British Standards.
Interagency Board	http://www.iab.gov/	Use of CBRN respirators by emergency responders has been endorsed by the Interagency Board for Equipment Interoperability and Standardization.
Chimney Sweep News – (Publication)	http://hometown.aol.com/snewsmail/index.html	Regardless of which respirator is selected, the device should be NIOSH-certified and used in the context of a respiratory protection program.
Navy Environmental Health Center	http://www-nehc.med.navy.mil/	Generic Respiratory Protection SOPs, August, 2006 requires use of NIOSH-approved respirators.
Department of Homeland Security (DHS) Office of Grants and Training (G&T)	http://www.ojp.usdoj.gov/odp/	NIOSH CBRN respirator standards were among the first adopted by the Department of Homeland Security. DHS now uses these standards to award grant monies for the purchase of PPE for the first responder community.
USN (Navy)	http://www.navy.mil/	Agencies with Written Programs that cite or reference NIOSH-certified respirators (with or without CBRN protection)
USCG (Coast Guard)	http://www.uscg.mil/	Agencies with Written Programs that cite or reference NIOSH-certified respirators (with or without CBRN protection)
USAF (Air Force)	http://www.af.mil/	Agencies with Written Programs that cite or reference NIOSH-certified respirators (with or without CBRN protection)
IAFF (International Association of Fire Fighters)	http://www.iaff.org/	Agencies with Written Programs that cite or reference NIOSH-certified respirators (with or without CBRN protection)
Veterans Administration	http://www.va.gov/	Agencies with Written Programs that cite or reference NIOSH-certified respirators (with or without CBRN protection)

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NIOSH PPT Program Evidence Package Aug 30, 2007

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NIOSH Certified CBRN Respirator Purchases

Appendix S provides a listing of Responder organizations the PPT Program has been able to identify as purchasers of respiratory protection equipment made available as a result of the CBRN outputs and intermediate outputs and outcomes as a result of the program's certification. The acquisition of this equipment demonstrates a change in the operation for these responders and their organizations as a result of the program's outputs.

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Los Angeles Fire Department, CA	October-07		SCBA (New)	1250	Unk	Unk	PPT Program personal communication 5 Apr 07 regarding "Los Angeles City Fire Department" 1250 On order should receive @ Oct 07
St. Michaels Fire Department, Talbot County, MD	March-07		SCBA (New)	15	0	0	Talbot Today
College Park, GA Fire Department	March-07	Scott	SCBA & cylinders	19	29	0	College Park Fire Department - News
Western Maryland / Fairplay Volunteer Fire Company in Washington County	March-07		SCBA & cylinders	18	36	0	Senator Benjamin L. Cardin : Maryland
Western Maryland / Corriganville Volunteer Fire Company in Allegany County	March-07		SCBA (New)	10	0	0	Senator Benjamin L. Cardin : Maryland
Funkstown Volunteer Fire Company in Washington County, MD	March-07		SCBA (New)	Unk	Unk	Unk	Senator Benjamin L. Cardin : Maryland
Helmetta Borough Fire Department, East Brunswick, NJ	February-07		SCBA (New)	Unk	Unk	Unk	Federal funds a big help for a small fire dept.
City of Peoria, IL	February-07		SCBA (New)	20	0	0	City Council Proceedings 27971
Durham, NC	February-07	C.W. Williams & Company Rocky Mount, NC	SCBA (New)	120	0	0	Date: February 5, 2007 To: Patrick W. Baker, City Manager Through: Wanda S. Page, Assistant City Manager
Solway Township Fire Department	January-07		SCBA (New)	Unk	Unk	Unk	Solway gets $110,818 (Proctor, Minnesota) 01-31-2007
Hoover Fire Department, AL	January-07		SCBA w Buddy Breathing System	30	0	0	Congressman Spencer Bachus - HOOVER FIRE DEPARTMENT TO RECEIVE $88,000 GRANT
Mendota Heights, MN Fire Department	January-07		SCBA (New)	Unk	Unk	Unk	Norm Coleman - United States Senator - Minnesota
Village of Brockport, NY	January-07	Sealed Bid	SCBA (New)	56	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA on 16 Jan 07
Enterprise, AL Fire Department	January-07		SCBA (New)	Unk	Unk	Unk	The Enterprise Ledger | Federal Grant To Improve Firefighters' Efforts
Mountainview, CO Fire Department	January-07	Scott	NXG2 Scott Air Pack	54	0	0	http://www.mountainviewfire.org/new_scba's.htm
Virginia Department of EmergencyManagement	January-07		SCBA	1500	Unk	Unk	PPT Program personal communication 23 Mar 07 regarding "CBRN SCBA Data Gathering - Update"

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Miami Township Fire & Rescue, Ohio	January-07		SCBA	44	Unk	Unk	PPT Program personal communication 23 Mar 07 regarding "CBRN SCBA Data Gathering - Update"
Massachusetts Department of Fire Services Regional Hazmat Response Teams	January-07		SCBA	162	Unk	Unk	PPT Program personal communication 23 Mar 07 regarding "CBRN SCBA Data Gathering - Update"
FBI Hazardous Materials Response Unit (HMRU)	January-07		SCBA	Unk	Unk	Unk	PPT Program personal communication 23 Mar 07 regarding "CBRN SCBA Data Gathering - Update"
NG Civil Response Team	January-07		SCBA	Unk	Unk	Unk	PPT Program personal communication 23 Mar 07 regarding "CBRN SCBA Data Gathering - Update"
Seattle, WA Fire Department	January-07		SCBA	218	Unk	Unk	PPT Program personal communication 26 Mar 07 regarding "Seattle Fire Department - CBRN SCBAs"
NY State OHS WMD Task Force NY State Police	January-07	MSA	Millennium CBRN APR	0	0	5000	PPT Program personal communication 26 Mar 07 regarding "New York State (NYS) - Office for Homeland Security (OHS) - CBRN Respirators (30,000 older APRs to be replaced with same model)"
NY State OHS WMD Task Force NY State Police	January-07	Scott	SCBA	100	Unk	Unk	PPT Program personal communication 26 Mar 07 regarding "New York State (NYS) - Office for Homeland Security (OHS) - CBRN Respirators (1100 More Scott SCBAs to be retrofitted this fall)"
Ashford Volunteer Fire Department, CT	December-06	Scott	SCBA (Air-Pak 50)	16	0	0	http://www.ashfordfire.org/
West Metro Fire-Rescue District, New Hope, MN	November-06		SCBA (New)	Unk	Unk	Unk	http://www.westmetrofire.com/whats_new.htm
Hicksville, NY Fire Department	November-06		SCBA (New)	Unk	Unk	Unk	HFD Reduces Budget While Maintaining Fire Protection
Burbank, CA Airport Fire Department	October-06		SCBA, cylinders & masks	12	24	19	Burbank Airport FD SCBA purchase
Brockport, NY Fire Department	October-06		SCBA (New)	56	0	0	http://www.westsidenewsonline.com/OldSite/westside/news/2006/1015/features/bkptfdreceives.html
Costa Mesa, CA Fire Department	October-06		SCBA Upgrades	5	0	0	City Council Agenda
Eureka County, NV	September-06		Cylinder Replacements	0	20	0	PPT Program personal communication regarding GPRA and SCBA purchase on 20 Sep 06
Mt Lebanon, PA Fire Department	August-06	Scott Aviation	SCBA	60	0	0	http://www.mtlfd.org/news/newsblurbs/index.shtml
Bonneville County Fire Protection District No. 1, Idaho Falls	July-06	Draeger Safety, Inc.	SCBA (New)	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase on 13 Jul 06 of $348,983 of Draeger SCBA
Gates-Chili Fire Department	March-06		SCBA & Masks	Unk	0	207	MPNnow.com: Grant gives Gates firefighters room to breathe
Dayton, MN Fire Department	March-06		SCBA, cylinders & masks	18	36	18	City Council Meeting regarding SCBA purchases

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
City of Pikeville, KY	March-06		SCBA & Masks	26	0	52	PPT Program personal communication regarding GPRA and Bid Notic on Scott CBRN SCBA
San Antonio, TX Fire Department	March-06	Interspiro	S4 SCBA	400	0	0	Firefighting - Firehouse Forums - Firefighting Discussion
Yutan Volunteer Fire Department	March-06	Scott	SCBA (New)	16	0	0	http://www.yutanvfd.org/
Ohio Fire Academy	March-06	Columbus Division of Fire	SCBA & cylinders (Used)	50	100	0	State Fire Marshal News
City of Holtville, CA	March-06		SCBA & Masks	13	0	26	City of Holtville
University Park, TX Fire Department	February-06		SCBA Masks	Unk	Unk	Unk	Fireman's Fund : Heritage Rewards&sm; Grant Goes to Texas Fire Department : Heritage
West Seneca, NY Fire Department	February-06		SCBA (New)	Unk	Unk	Unk	REP. HIGGINS ANNOUNCES $197,816 IN FEDERAL FUNDING FOR RESERVE HOSE | Government from AllBusiness.com
Waterford Township, MI	February-06		SCBA (New)	Unk	Unk	Unk	City Council Meeting Minutes
West Bend, WI	February-06	Scott	SCBA & cylinders	4	11	0	To: Dennis Melvin – City Administrator Doug Bade – Mayor Members o the Common Council
Village Fire Department, OK	January-06		SCBA, cylinders & masks	10	20	10	eNews 02-07
Knowlton Township, NJ Fire and Rescue	January-06		SCBA (New)	4	0	0	Fireman's Fund : New Jersey : Heritage
Hanover Park, IL Fire Department	January-06		SCBA & cylinders	32	64	0	Assistance to Firefighters and Aid to Firefighters Grants, Village of Hanover Park, Illinois (IL)
City of South Milwaukee Fire Department, WI	December-05	MSA	SCBA (Firehawk)	Unk	Unk	Unk	City of South Milwaukee Fire Department
Berkeley, CA Fire Department	December-05		SCBA (New)	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase of SCBA
North Branford, CT Fire Department	December-05	Shipman's Fire Equipment	SCBA (New)	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase by Berlin, CT of $400,000 of SCBA on 6 Dec 05
Harrison County Fire Service in Saucier, MS	November-05		SCBA (New)	10	0	0	Press release regarding SCBA purchases
Piedmont Fire Department , SC	November-05		SCBA (New)	24	0	0	http://www.thejournalonline.com/front4405.htm
Lynnwood, WA	October-05		SCBA Upgrades	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase by Lynnwood, WA of EMS CBRN SCBA Upgrades
Village of Hanover Park, IL	October-05	MSA	SCBA (New)	Unk	Unk	Unk	Assistance to Firefighters and Aid to Firefighters Grants, Village of Hanover Park, Illinois (IL)
Seymour, TN Volunteer Fire Department	October-05		SCBA (New)	Unk	Unk	Unk	http://www.seymourvfd.com/
Madison, GA Fire Department	October-05		SCBA (New)	6	0	0	New Equipment

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Wichita Fire Department	October-05		Cylinders & masks	0	20	20	1st Quarter report
Fowler Volunteer Fire Department, CO	October-05		SCBA (New)	Unk	Unk	Unk	http://www.fowlerfire.org/
Chattanooga, TN Fire Department	September-05		SCBA (New)	Unk	Unk	Unk	http://tn3hs.org/
Maynard, MA Fire Department	August-05		SCBA w Buddy Breathing System	21	0	0	Maynard Fire Awarded Federal Grant
Brown County, IL Fire Protection District	August-05		SCBA Upgrades	Unk	Unk	Unk	http://www.whig.com/287565110360297.php
Carthage Clipper, IL Fire Department	August-05		SCBA	14	0	0	http://www.whig.com/287565110360297.php
Griggsville, IL Fire Department	August-05		SCBA Upgrades	Unk	Unk	Unk	http://www.whig.com/287565110360297.php
Tri-Township, IL Fire Protection District	August-05		SCBA (New)	Unk	Unk	Unk	http://www.whig.com/287565110360297.php
Ann Arbor, MI Fire Department	August-05		SCBA (New)	Unk	Unk	Unk	MEMORANDUM TO: Mayor and Council FROM: Chief Daniel J. Oates, Safety Services Area Administrator DATE: October 4, 2005
Geneva Fire Department, NY	August-05		SCBA (New)	Unk	Unk	Unk	City of Geneva, New York -- Boehlert announces $737,849 in firefighter grants
Aura Vol. Fire Co, Elk Township New Jersey	August-05		SCBA (New)	Unk	Unk	Unk	http://www.elktownship.com/avfc.html
Turkey, NC Volunteer Fire Department	August-05		SCBA Faceshields and air cylinders	0	10	24	Turkey get grant for fire gear
Mifflin Township	July-05	Draeger	SCBA (Air Boss)	4	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Rahway, NJ Fire Department	July-05		SCBA (New)	Unk	Unk	Unk	FIRE DEPARTMENT AWARDED $39K GRANT FOR FIREFIGHTER SAFETY EQUIPMENT
Hartville, MO Rural Fire Protection Association	July-05		SCBA (New)	Unk	Unk	Unk	NEWS RELEASE
Caledonia, NY Fire Department	July-05		SCBA Airpak units	21	0	0	cfd fema grant 2005
Salem, OR Fire Department	July-05		SCBA (New)	Unk	Unk	Unk	City of Salem SCBA purchases
Kingston Fire Department	July-05		SCBA Upgrades	Unk	Unk	Unk	Rockingham News: Fire department receives $79.5K grant from DHS
City of Rancho Mirage, Auga Caliente	June-05		SCBA (New)	20	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Riverside County Fire Department, CA	June-05	Scott	SCBA (Air-Pak 50)	935	0	0	Riverside County Fire Department - News Releases and Incident Information

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Redding, CA Fire Department	June-05		SCBA (New)	82	0	0	Fire Department purchases SCBA
Louisville Fire & Rescue, KY	June-05	Scott	Air Cylinders	0	100	0	Metro Louisville Capital Improvement Program Fiscal Year 2004 - 2005
Hamilton County, Ohio	May-05	MSA SCBA from Vogelpohl Fire Equipment, Inc	SCBA & Masks	16	0	40	City of Montgomery Council Work Session Minutes - May 2005
Cape Girardeau, MO	May-05		SCBA & cylinders	49	94	0	City Of Cape Girardeau
City of Wauwatosa, WI	March-05		SCBA Upgrades	Unk	Unk	Unk	CITY OF WAUWATOSA
Washington Township, OH Fire Department	March-05	Fisher Scientific	SCBA Upgrades	Unk	Unk	Unk	City of Washington Township
Riverside County Fire Department, Morongo	March-05		SCBA (New)	100	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
City of Indio	March-05		SCBA (New)	19	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Riverside County Fire Department, Augustine	March-05		SCBA (New)	25	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Riverside County Fire Department, Pachanga	March-05		SCBA (New)	50	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Marysville Division of Fire, OH	March-05		SCBA (New)	Unk	Unk	Unk	State Fire Marshal News
Amarillo, TX	February-05	Panhandle Breathing Air Systems	SCBA (New)	Unk	Unk	Unk	THE STATE OF TEXAS
Oak Park, IL Fire Department	February-05		SCBA (New)	Unk	Unk	Unk	OP/FYI for February 2005 - Page 2 - Oak Park, IL
Wise, VA Volunteer Fire Department	January-05		SCBA (New)	8	0	0	The Online Office of Congressman Rick Boucher - Wise Volunteer Fire Department
Mount Cross, VA Volunteer Fire & Rescue	January-05		SCBA (New)	Unk	Unk	Unk	The Community Foundation of the Dan River Region
Santa Rosa, CA Fire Department	January-05		Modified SCBA for emergency rescue	5	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Sandusky, OH Fire Department	January-05		SCBA Faceshields and air cylinders	0	38	34	PPT Program personal communication regarding GPRA and purchase of SCBA
Shawnee Township Fire Department, Lima, OH	January-05		SCBA	24	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Halifax Regional Fire and Rescue, CA	January-05		SCBA (New)	161	0	0	Rural Operations Update
Englewood, NJ Fire Department	November-04		SCBA (New)	28	0	0	News Release
North Kitsap, WA Fire and Rescue	October-04		SCBA (New)	42	0	0	Legislative Issues - SCBA Grant
City of Santa Rosa, CA	October-04	MSAC brand fire service	SCBA (New)	160	0	0	City of Santa Rosa
Chattanooga, TN Fire Department's	October-04		SCBA (New)	Unk	Unk	Unk	10/28/2005 - Fire Chief Jim Coppinger: My Farewell Message - Opinio Chattanoogan.com
Whitmire, SC Fire Department	October-04	Scott 2.2	SCBA (New)	Unk	Unk	Unk	http://www.whitmirefire.com/
Aitkin, MN Fire Department	October-04		SCBA & masks	12	0	24	Aitkin Fire Department Aitkin Fire Department
City of Englewood Fire Department, NJ	October-04		SCBA & cylinders	28	47	0	News Release
Howlett Hill Fire Department, NY	October-04		SCBA (New)	Unk	Unk	Unk	Fund Raisers - help us
Williamsport, MD Volunteer Fire Company, Inc	September-04		SCBA w Buddy Breathing System	23	0	0	Senators Mikulski and Sarbanes Announce Federal Funding for Western Maryland Firefighters
Friendsville, MD Volunteer Fire & Rescue Department, Inc	September-04		SCBA w Buddy Breathing System	6	0	0	Senators Mikulski and Sarbanes Announce Federal Funding for Western Maryland Firefighters
Midland, MD Fire Company	September-04		SCBA w Buddy Breathing System	Unk	Unk	Unk	Senators Mikulski and Sarbanes Announce Federal Funding for Western Maryland Firefighters
Bowman's Addition Volunteer Fire Company, Inc. MD	September-04		SCBA w Buddy Breathing System	11	0	0	Senators Mikulski and Sarbanes Announce Federal Funding for Western Maryland Firefighters
Eleva, WI Volunteer Fire Department	September-04	Scott	Scott 2.2 AIRPAK 50,	10	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA
Fire Rescue Department, Davie, FL	September-04	Fisher Scientific	SCBA (New)	25	0	0	TOWN OF DAVIE TOWN COUNCIL AGENDA REPORT
Benedict Volunteer Fire Department	August-04		SCBA (New)	10	0	0	Rep. Steny Hoyer :: newsroom
Benedict, MD Volunteer Fire Department	August-04		SCBA & masks	10	0	50	Benedict Volunteer Fire Department To Receive Federal Grant For New Equipment
Fridley Fire Department, Anoka Champlain and Columbia Heights Fire Departments, MN	August-04		SCBA (New)	Unk	Unk	Unk	Fire News
Hamilton, VA Volunteer Rescue Squad	July-04	Scott	SCBA (Scott Pack)	6	0	0	Hamilton Volunteer Rescue Squad - Donate
Stanley, IA Fire Department	July-04		SCBA	12	0	0	http://www.stanleyiowa.com/

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Bloomington Township, IN Fire Department	July-04		SCBA Upgrades	Unk	Unk	Unk	http://www.btfire.org/grants.htm
Galt Fire Protection District, CA	July-04		SCBA, cylinders & masks	55	115	103	Donation of SCBA to Galt FD
Lexington County Fire Service, SC	May-04	Newton's Fire & Safety, Inc	SCBA (New)	15	0	0	May 11, 2004:Page 126 M I N U T E S LEXINGTON COUNTY COUNCIL MAY 11, 2004
East Bridgewater, MA Fire Department	April-04		SCBA (New)	25	0	0	http://www.firegrants.info/submission/successStory.aspx
Santa Clara, NM all-volunteer fire department	March-04		SCBA, cylinders & masks	6	6	6	http://www.firegrants.info/submission/successStory.aspx
Butte County, CA Fire Department	March-04		SCBA (New)	100	0	0	http://www.firegrants.info/submission/successStory.aspx
Victoria, MN Fire Department	February-04		SCBA (New)	22	0	0	City of Victoria, MN: City Council Minutes - February 26, 2004
Rock Island, IL	February-04	Scott Air-Pak	SCBA, cylinders & masks	38	76	17	FEMA Grant awarded
Navajo Nation Fire Department	January-04	ISI Digital Viking	CBRN 45 & CBRN 60	96	0	0	Navajo Nation Department of Fire & Rescue Services
Ramsey Fire Department MN	January-04		SCBA (New)	Unk	Unk	Unk	FEMA $91,510 grant received for Ramsey's fire department
Boston Fire Department, MA	January-04		SCBA	625	Unk	Unk	PPT Program personal communication 23 Mar 07 regarding "CBRN SCBA Data Gathering - Update"
Bay County, FL	November-03	Fisher Safety	SCBA & cylinders	63	126	0	Bay County Board of Commissioners,Bay County Florida, Commission Agenda Action Summary
Wilmington , DE	October-03		SCBA (New)	Unk	Unk	Unk	http://www.firegrants.info/submission/successStory.aspx
New Melle, MO Fire Protection District	October-03		SCBA	21	0	0	FEMA Grant
City of Bothell Fire and Emergency Medical Services	October-03		SCBA (New)	117	0	0	FEMA: FEMA Awards City Of Bothell Fire & EMS $712,755
Emmet - Chalmers Fire Protection District, IL	October-03	Scott 4.5	SCBA (New)	Unk	Unk	Unk	Emmet-Chalmers Fire Protection District - Equipment
Lafayette Township Volunteer Fire Department	October-03		SCBA (New)	Unk	Unk	Unk	http://www.ltvfd.org/grant.html
Largo Fire Rescue	September-03		SCBA (New)	Unk	Unk	Unk	Largo Fire Rescue SCBA Purchase
Bloomington Township, IN Fire Department	July-03		SCBA (New)	Unk	Unk	Unk	http://www.btfire.org/grants.htm
Bart Twp, PA Fire Co	July-03	Scott	SCBA (New)	Unk	Unk	Unk	http://www.bart51.com/grants.htm
Grand Rapids, WI Volunteer Fire Department	July-03		SCBA Upgrades & New	Unk	Unk	Unk	http://grandrapidsfd.com/history.htm

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
Villa Park, Illinois Fire Department	June-03		SCBA (New)	37	0	0	FEMA: Illinois Fire Department Receives First 03' Grant Award
South Wheatland Fire Department	June-03		SCBA & Masks	9	0	17	http://www.firegraphics.org/Grants/SWFD2003.htm
Dundee Township, MI Volunteer Fire Department	June-03		SCBA (New)	Unk	Unk	Unk	Dundee fire dept. raises over $200,000 in 3 years
Madison Jefferson, OH Fire Department	June-03		SCBA & Masks	12	0	22	Madison Jefferson Fire Department
Pendleton, OR Fire Department	April-03	MSA	SCBA (New)	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase of SCBA
San Jose, CA Fire Department	April-03		SCBA Upgrades & spare cylinders	Unk	150	Unk	Memo 9.1, April 8, 2003
Golden Fire Department, CO	April-03	Scott	SCBA A-50 Air pack Upgrades	Unk	Unk	Unk	Golden Colorado Scba Purchases
Mountainview, CO Fire Department	March-03		SCBA (New)	Unk	Unk	Unk	http://www.mountainviewfire.org/mvfpd_gets_grant.htm
Clayton, OH	January-03		SCBA (New)	Unk	Unk	Unk	CITY OF CLAYTON, OHIO
Miami Township, OH Fire Department	June-02		SCBA (New)	Unk	Unk	Unk	http://www.miamitownship.org/news.htm
US Air Force contract	March-02	TMC assisted Interspiro, USA	SCBA (New)	16,000	0	0	http://www.tmccompany.com/tmc_company_information.htm
San Gabriel, CA	February-02		SCBA (New)	16	0	0	Staff Report - April 2, 2002 - Agenda Item - 02
Pleasant Unity, PA Volunteer Fire Department	January-02		SCBA	10	0	0	http://www.puvfd.org/funds.htm
Chapel Hill Fire Department, NC	November-01	Newton's Fire & Safety, Inc	SCBA (New)	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase of SCBA
NSWC Fire Department (Navy) PA	October-01		SCBA (New)	Unk	Unk	Unk	PPT Program personal communication regarding GPRA and purchase of SCBA
Durham, NC	September-01	Stevens Fire Equipment Morganton, NC	Replace SCBA Facepieces	Unk	Unk	Unk	DURHAM CITY COUNCIL ACTION AGENDA
Sandy, OR Fire Department	July-01		SCBA Upgrades	Unk	Unk	Unk	http://www.sandyfire.com/chief.html
Georgetown, CA Fire Department	January-01	Survivair	SCBA (Panther)	38	0	0	http://www.georgetownfiredepartment.com/about-equipment.htm
East Moline, SC Fire Department	June-00	Scott	SCBA (New)	20	0	0	PPT Program personal communication regarding GPRA and purchase of SCBA

CBRN Purchases

Fire Department / Organization	Date of Purchase	Manufacturer	Type of Equipment	# of SCBA	# of CYL (Sep Total)	# of Masks (Sep Total)	Link
SeaTac City Council, WA	February-00	SeaWestern Fire Apparatus and Equipment, MSA	SCBA & cylinders	42	80	0	SEATAC CITY COUNCIL
		Purchases	# of SCBA*	23,682			
			# of Cylinders * listed as a separate purchase	1,202			
			# of Masks* listed as a separate purchase	5,689			

* Does not include purchases listed as unknown amounts

NIOSH PPT Program Evidence Package Aug 30, 2007

Appendix T Back to the AppendicesTable of Contents

Respiratory Training Programs

Appendix T includes a selection of entities with internet links demonstrating that they maintain a respiratory protection program for the reduction of their employees' exposures to inhalation hazards, or that they provide products and/or services to establish or maintain those programs. The listing is not intended to be comprehensive of all products or services available in the marketplace, but does serve as an indicator of the diversity of customers across the US economy that support or participate in the use of outputs and outcomes derived from the PPT Program.

Respiratory Training Programs

Organization / Topic	URL	Remarks
Chemical Companies & Labs	**5**	
Brookhaven National Laboratory	http://www.bnl.gov/esh/shsd/sop/pdf/IH_SOPS/IH7210.pdf	The purpose of this procedure is to document the role of BNL organizations in the delivery of services that lead to an effective Respiratory Protection Program.
Jefferson Lab	http://www.jlab.org/ehs/manual/RadCon-41.html	Respirators shall be issued only to personnel who are trained, fitted and medically qualified to wear the specific type of respirator. Training and qualification testing shall be performed as specified in the ESH&Q Manual Chapter 6630 Respiratory Protection . The use of respiratory protection for radiological controls sha be done in accordance with the Jefferson Lab respiratory protection program as specified in the ESH&Q Manual Chapter 6630 Respiratory Protection. 1/3/04
Respirator use in the chemicals and allied products manufacturing industry	http://www.chemweb.com/journals?type=issue&jid=18715532&iid=00130006	The Bureau of Labor Statistics (BLS) has determined that the chemicals and allied products manufacturing industry (CAP) had 3.5 cases of respiratory conditions per 10,000 full-time workers in 2002, as compared to 2.5 cases for all of private industry. 3/24/2006
The University of Texas at Austin Physical Plant / Respiratory Protection Policy & Procedures	http://www.utexas.edu/physicalplant/adminpers/safety/policies/RespProtection.pdf	In order to control occupational diseases associated with such exposures, the Respiratory Protection Program primary objective is to inform employees on how to identify and evaluate respiratory hazards in the workplace, select/use appropriate protective devices for the particular hazard, and maintain and care for the respiratory protection. 7/1/2002
USDA/ARS Poisonous Plant Research Lab Respirator Management Program	http://www.ars.usda.gov/SP2UserFiles/ad_hoc/54282000LaboratorySafety/Images/RESPPROG.pdf	This document shall be the PPRL Respirator Management Program, which will be made available to, and followed by, anyone required to use respiratory protection. 9/20/2005
Consultants, Education and Training	**15**	
3 M	http://solutions.3m.com/wps/portal/3M/en_US/Occupational-Health/Environmental-Safety/Training-Tools/Respiratory-Protection/Training-Courses/	3M offers comprehensive professional development courses to provide the most current information on respiratory protection, managing a respiratory protection program and applicable regulations. We offer training for the respirator user as well as for the respirator program administrator.
All Safety Products, Inc	http://www.allsafetyproducts.biz/site/323655/product/SAS%206000-25	Every facility utilizing respiratory equipment needs this manual. It includes operational procedures for proper use of cartridge and supplied-air respiratory systems, forms for adherence to OSHA guidelines and tips to he ensure employees' use of respiratory equipment efficiently and safely.
Business and Legal Reports (BLR)	http://www.blr.com/product.cfm/product/79110400/funcode/WI01	This video explains the general requirements for an effective respiratory protection program. Use it to deliver required HAZWOPER, Hazcom, or other OSHA required training on this important compliance topic. Explains how to get a good fit, test, wear, inspect, and maintain their equipment. But most important, how to select the right respirator to match the hazard present.
DuPont	http://www2.dupont.com/Safety_Products/en_US/index.html	DuPont safety methodologies and techniques have been successfully applied throughout our many worldwide locations and have helped thousands of companies realize extremely low injury and incident rates on the job.
Elsevier Practical Guide To Respirator Usage In Industry	http://www.elsevier.com/wps/find/bookdescription.cws_home/677389/description#description	This new edition outlines the design and implementation of an effective respiratory protective equipment program for industries in which workers are at risk from inhaled particulates, toxins and other hazardous materials. 5/1/02
Enviroair Consultants, Inc	http://www.argus-group.com/enviro/envresp.htm	Enviroair Consultants provides complete Respirator Program services to aid those companies that have a responsibility to provide respiratory protection to employees and to maintain respirator equipment integrity. The following briefly describes our current Respiratory Program.

Respiratory Training Programs

Organization / Topic	URL	Remarks
Envirocare Consulting Services, Inc	http://envirocareconsulting.com/industrialhygiene.html	Envirocare's staff can meet the many challenges that face company's who must manage industrial hygiene work practices. Envirocare has the technical equipment needed to facilitate a timely response to a customer's industrial hygiene needs.
Hanford Atomic Metal Trades Council (HAMTC)	http://www.hanford.gov/reach/viewpdf.cfm?aid=290	At the Volpentest HAMMER Training and Education Center, workers practice daily how to cope with situations like unexpected loss of supplied air. Just as first aid courses prepare each of us for unforeseen emergencies, HAMMER instructors teach workers to respond to unanticipated respiratory situations swiftly and confidently.
KTA-Tator, Inc / Coatings and Corrosion related products and services	http://www.kta.com/services/compliance%20programs.htm	KTA can prepare a Corporate Safety and Health Program, under the direction of a Certified Industrial Hygienist. Specifically, the program contains specific policies, rules and guidance relative to each of the general areas: Personal Protective Equipment (including respiratory protection)
MSA	http://media.msanet.com/NA/USA/APR/ConventionallyMaintainedRespirators/ComfoClassicHalfMaskRespirators/1000-61KeyElementsResp.pdf	MSA can help you take a comprehensive approach to sound Respiratory Protection practices. This guide will help you understand the need for respirators, how they work, and what their limitations are. 4/1/04
Ninyo and Moore	http://www.ninyoandmoore.com/ih_rp.html	Ninyo & Moore is experienced with designing respiratory protection programs and seeing them through to proper implementation. 2006
Respiratory Protection in the Workplace A Practical Guide for Small-Business Employers	http://www.dir.state.ca.us/dosh/dosh_publications/respiratory.pdf	Respiratory Protection in the Workplace: A Practical Guide for Small-Business Employers was developed a prepared for publication by the Cal/OSHA Consultation Service, Research and Education Unit, Division of Occupational Safety and Health, California Department of Industrial Relations.
Twin Ports Testing, Inc / Industrial Hygiene Services	http://www.twinportstesting.com/ihyg.htm#respirator	Twin Ports Testing personnel can draft a respiratory program specific to your organization, conduct the initial fit testing and respirator use training, as well as provide annual fit testing, respirator use training, and progra maintenance thereafter.
USA Safety Supply	http://www.usasafetysupply.com/custpage.asp?src=custpages/services.htm&title=Services	USA Safety Supply employees are experts in providing proper service and training for all of your safety needs. We provide service and training for respiratory programs and many others.
W. F. Biggins Associates, Inc	http://www.wfba.com/Std_svcs.htm	We perform services to achieve compliance with many regulations, but some needs arise more often than others. Since we do carry out these services more frequently, they might be considered 'Standard' services.
Manufacturing and Labor	**12**	
Center for the Polyurethanes Industry	http://www.polyurethane.org/s_api/sec.asp?CID=885&DID=3561	CPI developed a Model Respiratory Protection Program. The program, divided into ten steps, provides user-friendly documents for facilities and guidance on appropriate respirators, respirator use, storage, fit and evaluation. 2007
City of Kettering, Ohio	http://www.ci.kettering.oh.us/newweb/pdfs/human_resources/safety/RespiratoryProtectionProgram.pdf	The purpose of a respiratory protection program is to ensure the protection of all employees from inhaling hazardous chemicals in the air. Chemicals can be in the form of gases, vapors, mists or dust. Respirators are be used only when engineering control of respirator hazards is not feasible, when engineering controls are being installed or in emergencies. 8/1/06
Foundry Management and Technology	http://www.foundrymag.com/full_story.php?WID=16308	The number of indicators of potentially inadequate respiratory protection programs in Primary Metal Industries demonstrates a need for improvement. It is the obligation of each establishment to evaluate its own respiratory protection program with respect to the OSHA requirements, and NIOSH recommendations and make appropriate changes. Apr 07

Respiratory Training Programs

Organization / Topic	URL	Remarks
Indiana Department of Labor	http://www.in.gov/labor/insafe/respiratory.html	No booklet can cover every situation in the workplace where respirators should be worn. Nonetheless, this booklet presents considerable information on respiratory equipment and complements the relevant safety and health regulations and manufacturers' requirements.
Kenai Peninsula Borough, Alaska	http://www.borough.kenai.ak.us/RiskManagement/respiratory.htm	The Borough Safety Manager, Dennis Tidwell, coordinates the District's Respiratory Protection Program and is responsible for identifying respiratory hazards, recommending controls for reducing respiratory hazards, training employees about specific respiratory hazards, and specifying and fit-testing respirators for employees who need to use them. The District's Nurse Coordinator is responsible for assessing the medical fitness of employees who use respirators on the job.
KTA-Tator, Inc / Coatings and Corrosion related products and services	http://www.kta.com/services/compliance%20programs.htm	KTA can prepare a Corporate Safety and Health Program, under the direction of a Certified Industrial Hygienist. Specifically, the program contains specific policies, rules and guidance relative to each of the general areas: Personal Protective Equipment (including respiratory protection)
Metal Producing and Processing	http://www.metalproducing.com/full_story.php?WID=16271	National Institute for Occupational Safety and Health researchers study employer-survey data to determine the application of respirators — and discover a widespread need for improvements in the manufacturing sector. Mar 2007
Montana Department of Labor & Industry	http://erd.dli.mt.gov/safetyhealth/brochures/respiratory.pdf	Compliance with the requirements of this policy is a condition of employment and will be strictly enforced under the referenced disciplinary procedure.
North Carolina Department of Labor	http://www.nclabor.com/osha/consult/sampleprograms/RespiratoryProtection.pdf	This sample program is provided to assist you as an employer in developing programs tailored to your own operation. We encourage you to copy, expand, modify and customize this sample as necessary to accomplish this goal. 6/27/05
Respiratory Protection Program for Auto Refinish Shops - Final	http://www.epa.gov/dfe/pubs/auto/respirator/rpp.pdf	The purpose of this document is to assist auto body shops in developing a respiratory protection program that protects the health of their employees and meets the requirements of OSHA's Respiratory Protection standard, 29 CFR 1910.134. 11/10/2002
Texas Workers' Compensation Commission	http://www.saftek.net/pdfs/wp_resp.pdf	The following information provides supervisors with a basic knowledge of respiratory protection as well as a working knowledge of the process of developing an effective respiratory protection program. 7/1/03
Washington State Department of Labor and Industries	http://www.lni.wa.gov/Safety/Topics/AtoZ/RespProtection/default.asp	In Washington State, the requirements for all other industries relating to respiratory protection have been moved to Chapter 296-842 WAC, Respirators, and Chapter 296-841 WAC, Respiratory hazards. Extra respiratory protection requirements may apply if your workplace is covered by other health & safety standar addressing contaminant-specific or industry-specific work.
Healthcare	**3**	
BarnesCare BJC Healthcare System	http://www.barnescare.com/barnescare_content.aspx?id=1329	This core policy sets forth the minimum standards that must be met at each BJC entity with respect to the Respiratory Protection Program. Each BJC entity shall adopt a written policy that meets these minimum requirements. The adopted policy may also contain provisions beyond these minimum requirements, as long as the additional provisions in no way conflict with or abrogate the terms of this core policy. 4/1/02
MeritCare Health System Fargo, ND	http://www.meritcare.com/specialties/occupational/services/respprotection.aspx	A trained program administrator must oversee and evaluate the respirator program. The administrator must b suitably trained and have the appropriate accountability and responsibility to manage the full respiratory protection program. 2007
Minnesota Department of Health	http://www.health.state.mn.us/divs/idepc/dtopics/infectioncontrol/rpp/	The purpose of this program is to ensure that all employees required to wear respiratory protection as a condition of their employment are protected from respiratory hazards through the proper use of respirators.

Respiratory Training Programs

Organization / Topic	URL	Remarks
Construction	**3**	
Michigan (MIOSHA) / Chromium (VI) Exposure in Construction and General Industry	http://www.michigan.gov/documents/cis/wsh_constfact_hexavalent_chromium_178567_7.htm	The MIOSHA Part 604 and Part 315 apply to construction work and general industry work, respectively, where employees may be exposed to Cr (VI). Unless otherwise stated, the following requirements apply to both construction and general industry.
North Carolina department of Labor / A Guide to Lead Exposure in the Construction Industry	http://www.nclabor.com/osha/etta/indguide/ig6.pdf	In the construction industry, respirators must be used at times to supplement engineering controls and work practices whenever these controls are technologically incapable of reducing worker exposures to lead to 50 µg/m3 or below.
Washington Department of Labor and Industries	http://www.lni.wa.gov/Safety/Rules/Policies/pdfs/WRD225.pdf	Focused Inspections In Construction 17 Nov 06
Universities/ Respiratory Protection Programs	**31**	
Algonquin College	http://www.algonquincollege.com/physical_resources/Document%20Inserts/Occupational%20Health%20&%20Safety%20Programs/Respiratory%20Protection%20Program.pdf	Selection of the proper respirator(s) to be used in any work area or operation at Algonquin College is made only after a determination has been made as to the real and/or potential exposure of employees to harmful concentrations of contaminants in the workplace atmosphere. This evaluation will be performed prior to the start of any routine or non-routine tasks requiring respirators. 9/1/2003
Brigham Young University	http://safety.byu.edu/safety_programs/RespiratoryProtect.htm	THIS Program is under CONSTRUCTION as of 04/11/2007! Questions contact Kerry Smith 422-2943
California State University Northridge	http://www-admn.csun.edu/ehsr/ehs/programs/respiration_pgm.htm	The requirements of this program apply to university employees who may use respiratory protective devices. 12/2/03
Colgate University	http://offices.colgate.edu/chemmgt/respiratoryprotectionwp.html	The use of respirators at Colgate University is subject to prior review and approval by the Program Coordinator. Any individual who has received approval by the Program Coordinator to use a respirator must be enrolled in the Respiratory Protection Program.
Colorado State University	http://www.ehs.colostate.edu/WResp/Home.aspx	Every Colorado State University employee who wears respiratory protection must participate in the Respiratory Protection Program. Detailed information about the Respiratory Protection Program can be found in the Respiratory Protection Procedures. 5/7/07
Cornell University	http://www.ehs.cornell.edu/ochs/rpp.htm	The Cornell University Respiratory Protection Program, through the requirements described in this manual, establishes a program for the use of respirators. The criteria is designed for those University personnel who, during their normal duties, are or could be exposed to hazardous substances or atmospheres that may affect their well being or their health, or that may otherwise be detrimental to their safety.
Department of Environmental Health and Safety (DEHS) / University of Minnesota	http://www.dehs.umn.edu/safety/rpp/	The Respiratory Protection Program has been established to protect the health of workers who wear respirators and assure compliance with State and Federal law. General respiratory protection requirements are found in the Code of Federal Regulations at 29 CFR 1910.134; additional requirements are found in industry and substance specific worker protection standards.
Indiana University	http://www.ehs.indiana.edu/osha/respiratory.pdf	The purpose of this Respiratory Protection Program is to: Protect IU personnel from identified inhalation exposure hazards; and, Comply with Indiana University safety and health policy and applicable OSHA standards. 10/15/01

Respiratory Training Programs

Organization / Topic	URL	Remarks
Iowa State University	http://www.ehs.iastate.edu/publications/manuals/respirator.pdf	Iowa State University is responsible for ensuring the safety of its employees and for complying with all applicable requirements of state and federal regulations. Because of the importance the administration places on safety, ISU employees at all levels to are encouraged to promote positive attitudes regarding safety, incorporate safety into their work practices, and cooperate fully in the implementation of safety-related programs. 4/1/02
Michigan Technological University	http://www.admin.mtu.edu/fm/oshs/respirator_program/index.htm	Employees who are required to wear a respirator do so at no cost to them. The expense associated with training, medical evaluations, and respiratory protection equipment will be born by MTU.
New Mexico State University	http://www.nmsu.edu/~safety/programs/indust_safety/NMSU_Respirator_Program.pdf	NMSU Environmental Health and Safety (EH&S) will conduct training and fit-testing in order to qualify users prior to wearing respirators and annually thereafter. Technical assistance such as air sampling and analysis may be conducted by staff Industrial Hygienists, Safety Specialists, or Safety Officers. 5/1/01
North Seattle Community College	http://northonline.sccd.ctc.edu/rpp/	NSCC has determined that some of its employees are or can be exposed to respiratory hazards. The purpose this program is to ensure that all employees are protected from exposure to these hazards.
Oklahoma State University	http://www.pp.okstate.edu/ehs/manuals/Rsprator.htm	The purpose of the Respiratory Protection Program is to ensure that all employees have adequate respiratory protection in the workplaces on the Oklahoma State University campus where engineering controls or work practices that are inadequate or not feasible to reduce the exposure to airborne contaminates. 4/1/02
Princeton University	http://web.princeton.edu/sites/ehs/healthsafetyguide/C4.htm	The use of respirators at Princeton University is subject to prior review and approval by EHS, per University policy. The OSHA Respiratory Protection Standard regulates any use of respiratory protection. 1/11/07
University of Delaware	http://www.udel.edu/OHS/respiratory.html	The University's Respiratory Protection program is established to protect individuals from exposure to respirable contaminants in the work place. In general, the use of respiratory protection is only allowed when respirable hazards cannot be eliminated through substitution or engineering controls. All use of respiratory equipment must be approved by the Department of Occupational Health and Safety.
University of Florida	http://www.ehs.ufl.edu/General/resppol.pdf	The Division of Environmental Health and Safety (EH&S) administers this program as part of its mission to maintain employee health and safety throughout all University of Florida (UF) locations. 2/1/03
University of Guelph	http://www.uoguelph.ca/ehs/policies/05-06.pdf	To outline University policy regarding the use of approved respiratory protection to protect employees from airborne hazardous contaminants. 9/1/00
University of Louisville	http://louisville.edu/admin/dehs/RPP/respiratoryprogram.htm	This document applies to University of Louisville personnel who are required to wear respirators and those who choose voluntarily to use respirators. 1/1/03
University of Maryland	http://www.des.umd.edu/os/respirator/manual/index.html	The University of Maryland shall establish procedures for the selection, use and care of respiratory protective devices. When respirators are to be used, all requirements contained within the UM Respiratory Protection Program shall be followed. 2007
University of North Carolina at Chapel Hill	http://ehs.unc.edu/workplace_safety/respiratory/index.shtml	The University of North Carolina Respiratory Protection Program provides respirators to protect the health of employees in accordance with OSHA 1910.134. The program includes medical surveillance, training, and fit-testing. 8/2/06
University of Pennsylvania	http://www.ehrs.upenn.edu/programs/occupat/upennresp.html	The purpose of this program is to ensure that all University of Pennsylvania employees and students are protected from exposure to these respiratory hazards. 10/20/05

Respiratory Training Programs

Organization / Topic	URL	Remarks
University of Pittsburgh	http://www.ehs.pitt.edu/gensafety/UP-Respiratory%20Protection%20Program-Rev2003.pdf	This University of Pittsburgh Respirator Program contains guidelines for administering an effective respiratory protection program and provides the information, training, and equipment necessary for proper selection, use and maintenance of respirators. The Program is updated annually to address the changing needs of the University along with federal regulatory revisions as listed below in the reference section. This document serves as a standard operating procedure (SOP) for faculty. 1/1/03
University of Southern California (USC)	http://capsnet.usc.edu/EHS/OccupationalSafety/RespiratoryProtection/index.cfm	The purpose of this Program is to protect university personnel from hazardous airborne contaminants, and to meet regulatory requirements regarding respiratory protection. This document provides guidelines for the selection, use and maintenance of respirators throughout the University. 8/9/04
University of Tennessee	http://web.utk.edu/~ehss/resp/resp1.htm	The primary focus of this written program is to provide guidance in the proper use of respirators. The intent this document is educational, preventive and to fulfill the requirements for a written control plan required by the Occupational Safety and Health Act (OSHA), Title 29 of the Code of Federal Regulations, 1910.134. 4/22/98
University of Texas Health Science Center at San Antonio	http://www.uthscsa.edu/safety/respiratory.pdf	This program establishes a respiratory protection plan to ensure the protection of all UTHSCSA faculty, staff, students and visitors from respiratory hazards through the proper use of approved respirators. This document outlines the institutional policies necessary to meet the regulatory intent for the proper use of approved respirators where engineering controls of respiratory hazards are not feasible or effective, while engineering controls are being installed or for emergency or other temporary situations. 7/1/04
University of Utah	http://www.utahehs.org/index.php?tier=4&id=245	This document communicates the University's strategy for compliance with OSHA's Respiratory Protection Standard 29 CFR 1910.134 . It applies to all operations and employees of the University.
University of Wisconsin at Green Bay	http://www.uwgb.edu/busfin/safetyrisk/Policy/respiratory_protection/index.htm	The purpose of this program is to ensure the protection of all UW-Green Bay employees from respiratory hazards in the workplace through proper use of respirators. 1/1/05
University of Wisconsin at Milwaukee	http://www.uwm.edu/Dept/EHSRM/IEH/RESPIRATOR/PPS_Program.html	Respirator Program for the Carpentry, Masonry, Painting, Facilities Maintenance and Mechanical Shops Revised December, 2003
Virginia Polytechnic and State University	http://www.ehss.vt.edu/Programs/OHIH/Resp/respiratoryprogram.htm	All Virginia Tech employees are eligible to receive a wide variety of services through Environmental, Health and Safety Services free of charge.
Washington State University	http://www.wsu.edu/manuals_forms/HTML/SPPM/S80_Occupational_Health/S80.80_Respiratory_Protection_Program.htm	To help ensure the health of employees at Washington State University, Environmental Health and Safety (EH&S) administers the respiratory protection program. 10/1/04
Weill Medical College of Cornell University's ("WMC") Environmental Health and Safety (EHS) Program	http://www.med.cornell.edu/ehs/manuals/7.1_Respiratory_Protection_Program.pdf	This document shall serve as the Weill Medical College of Cornell University's (WCMC) formal written program. This program shall be routinely reviewed by Environmental Health and Safety (EHS) personnel to address its efficacy and maintain provisions as deemed necessary.

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NIOSH PPT Program Evidence Package Aug 30, 2007

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Respirator Certification Workflows

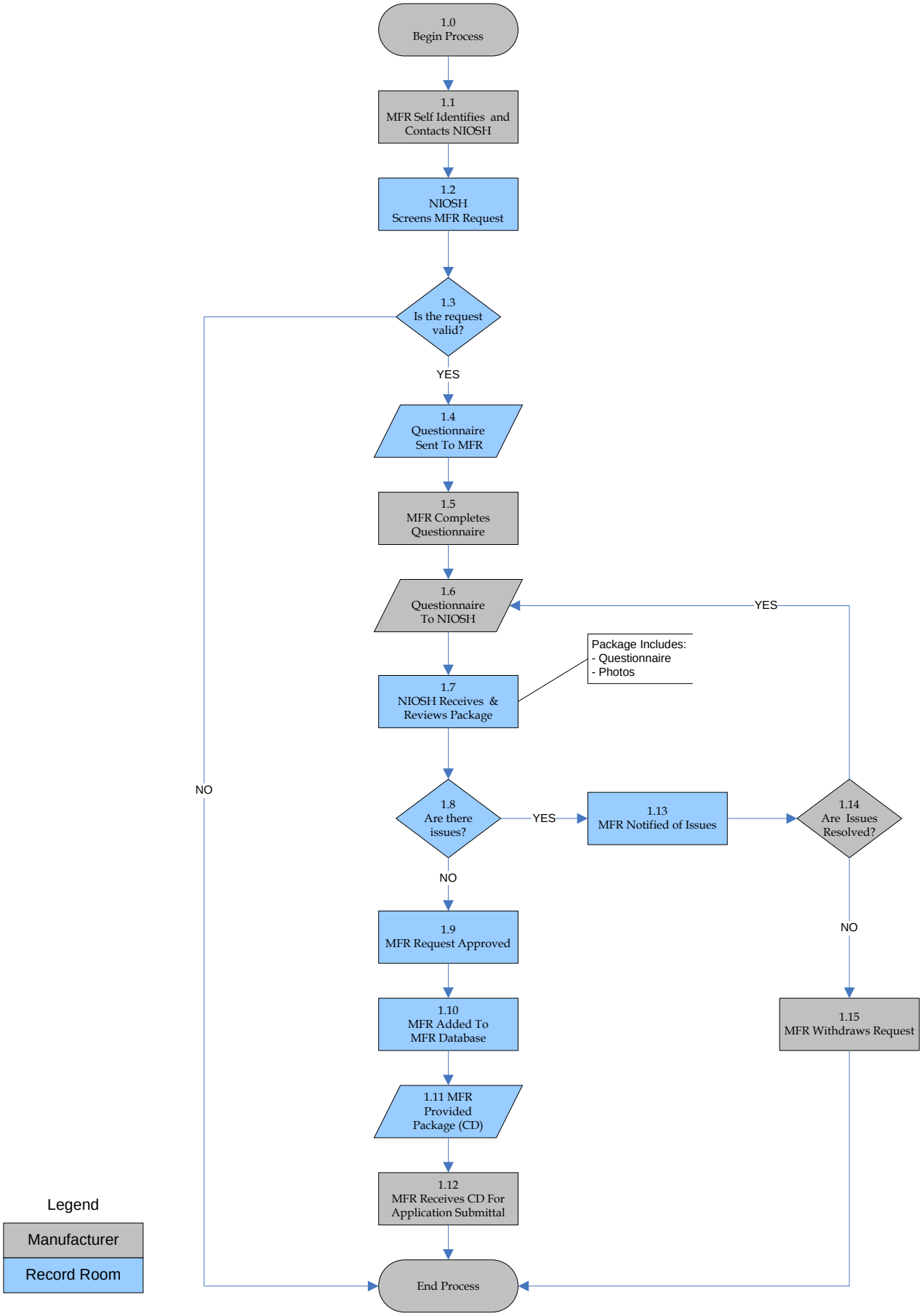
A manufacturer must register with the PPT Program and receive an applicant (or manufacturer) code under which all applications are submitted before submitting an application for approval . The process is part of the certification activities that help validate the level of quality assurance of the manufacturing facility to be at the level required to manufacture certified respirators. If a manufacturer does not have a manufacturer code, then a code is requested by filling out the application following workflow CWF_1.0 Self Identification Workflow. CWF_1.0 describes how the PPT program will process the application once the application is received, if the request is valid. If the request is not valid, then the process will proceed through workflow CWF_2.0 Information Change Workflow for the change management of the process.

A manufacturer code remains valid, once issued to the manufacturer, to be used to submit any of the eight possible application types. The type of application received will determine how the information is processed through the PPT Program. The flow of the application is described in the various flow charts listed below:

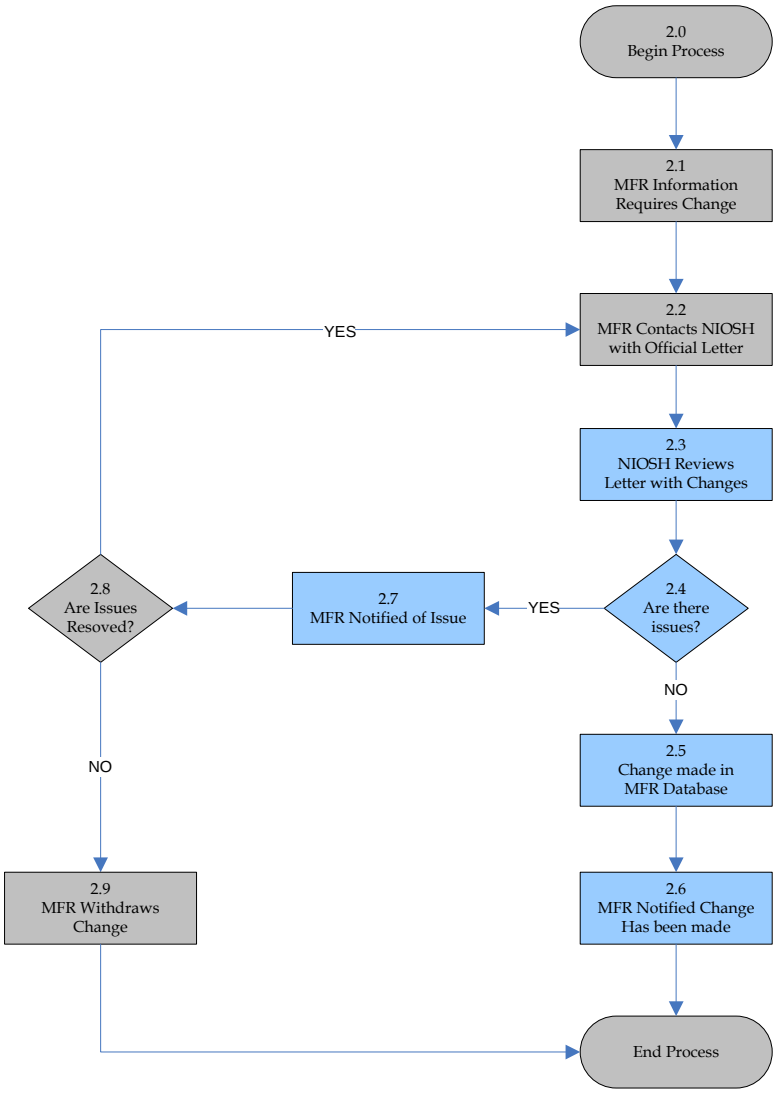
Workflow CWF_3.0 New Approvals Workflow (used for a configuration not previously listed with the PPT Program)
Workflow CWF_4.0 Modification Workflow (used for a limited modification to a configuration previously listed with the PPT Program)
Workflow CWF_5.0 Correlation Workflow (used for obtaining PPT Program official test results on sample hardware)
Workflow CWF_6.0 Prototype Workflow (used for obtaining PPT Program official test results on a non-production version of a respirator configuration where the production version is expected to be a candidate for certification.)
Workflow CWF_7.0 Private Labels (used for an already-certified configuration where the applicant is listed by the PPT Program as the manufacturer, and now wants to identify another entity on the approval label of the certified respirator, although the applicant remains solely responsible for the quality and performance of the respirator.)
Workflow CWF_8.0 Manuals Workflow (used for a requested review of the acceptability of the manufacturing site's quality system and it's documentation without application to or evaluation of any manufactured product.)
Workflow CWF_9.0 CBRN Workflow (New) (used for a configuration not previously listed with the PPT Program as providing CBRN inhalation protection)
Workflow CWF_10.0 CBRN Workflow (Modification) (used for a limited modification to a configuration previously listed with the PPT Program as providing CBRN inhalation protection)

These ten workflows all document PPT Program activities in the respirator certification activities then generate an output of either affirmative certification notification or negative (denial or rejection) certification notification.

CWF_1.0 Self Identification Workflow



CWF_2.0 Information Change Workflow

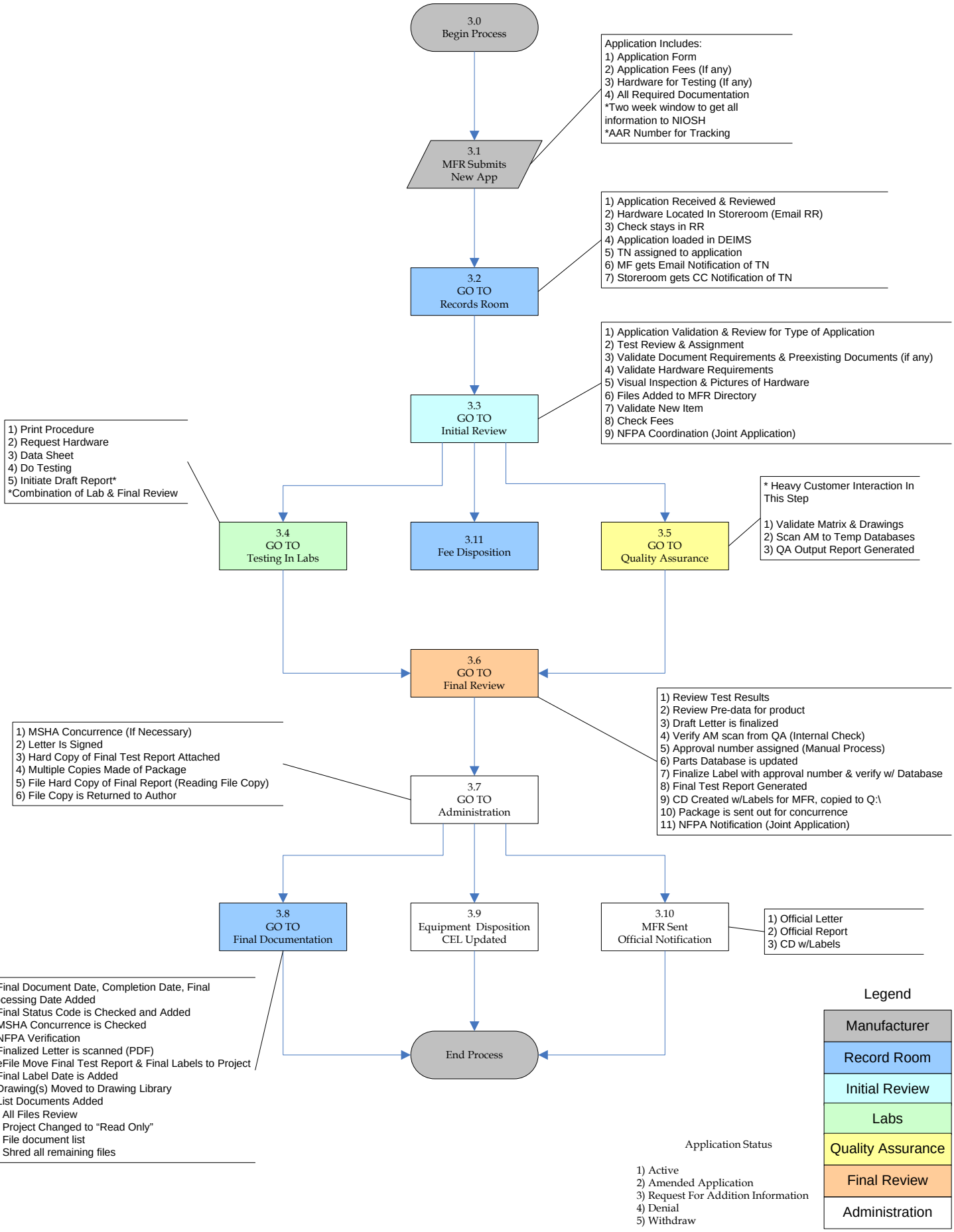


Legend

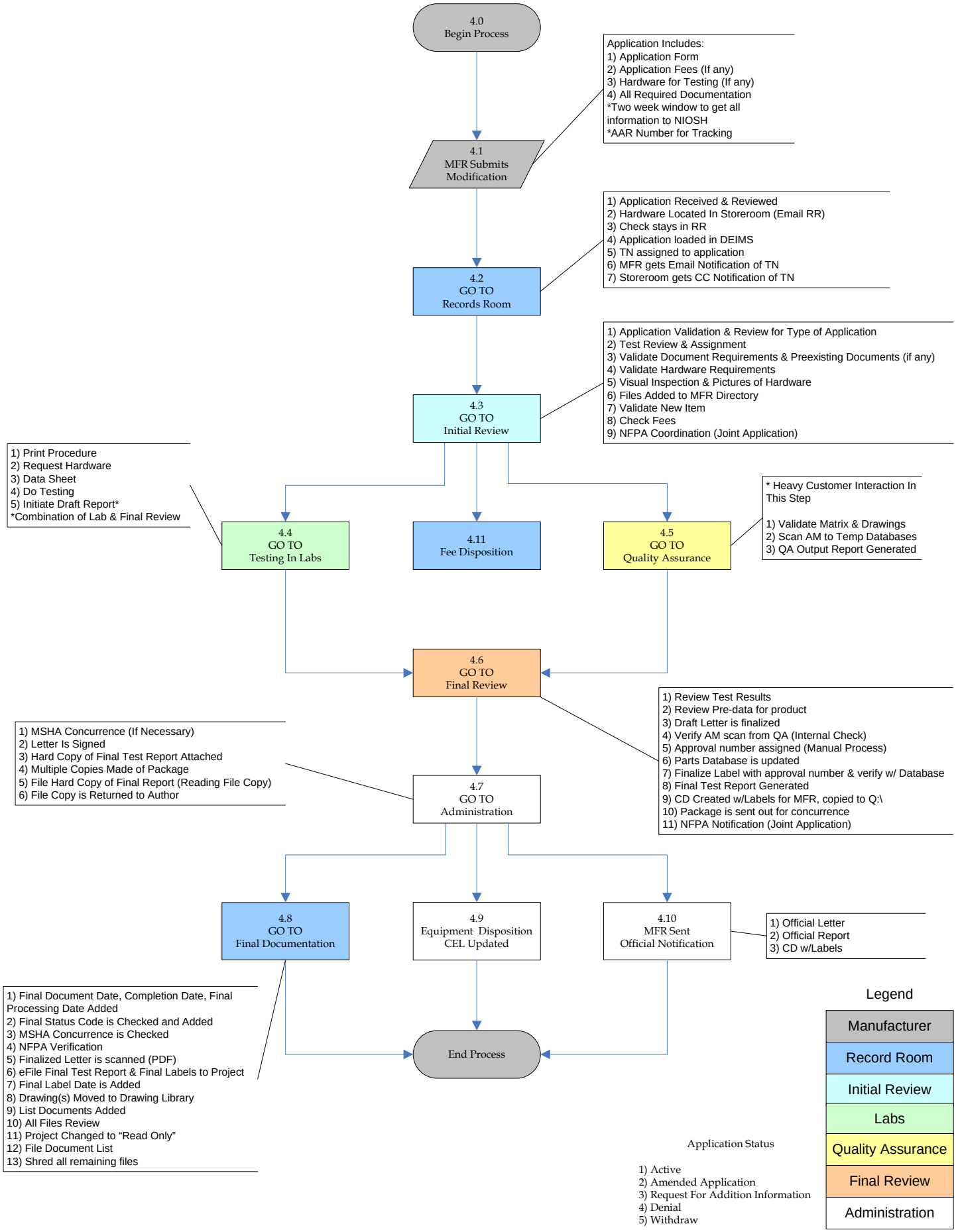
Manufacturer

Record Room

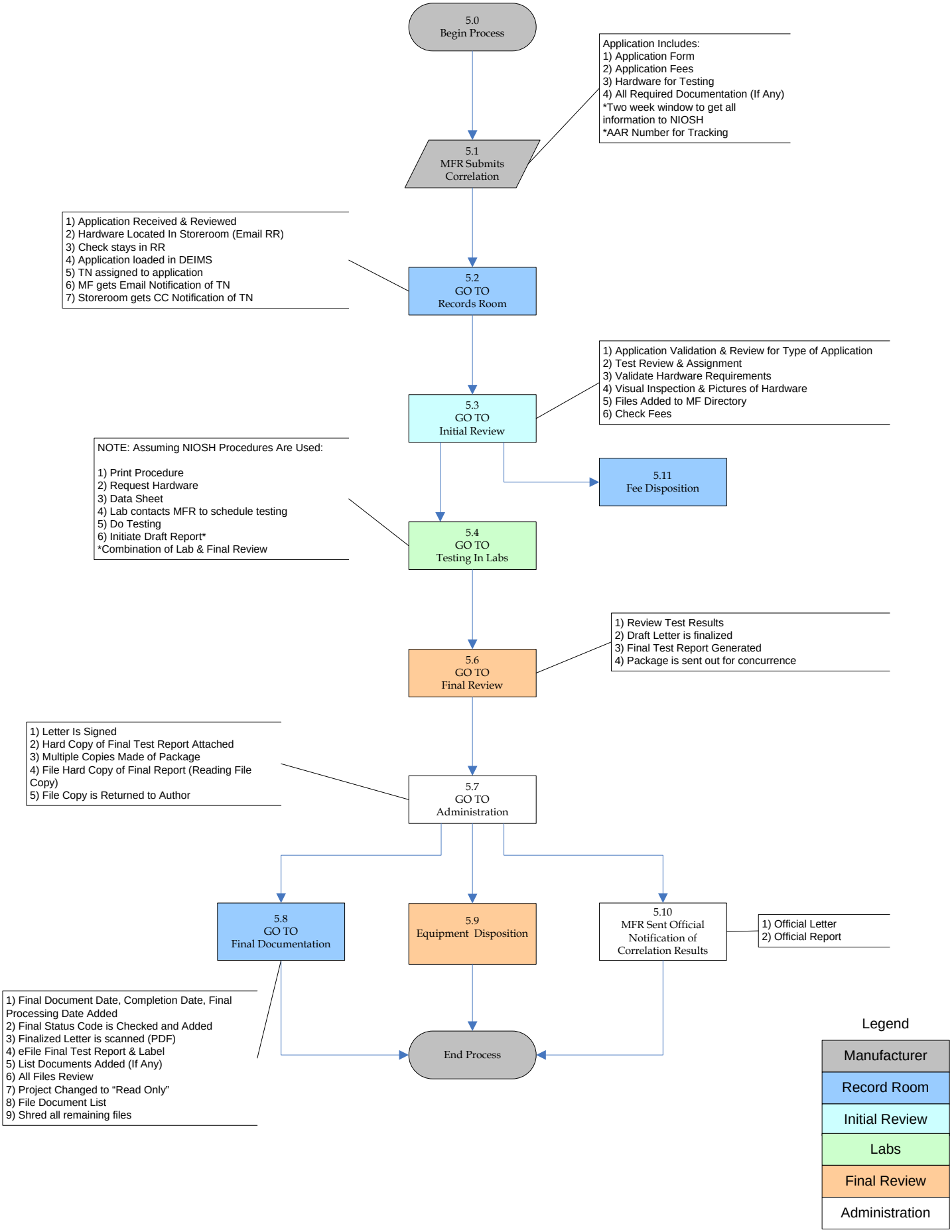
CWF_3.0 New Approvals Workflow



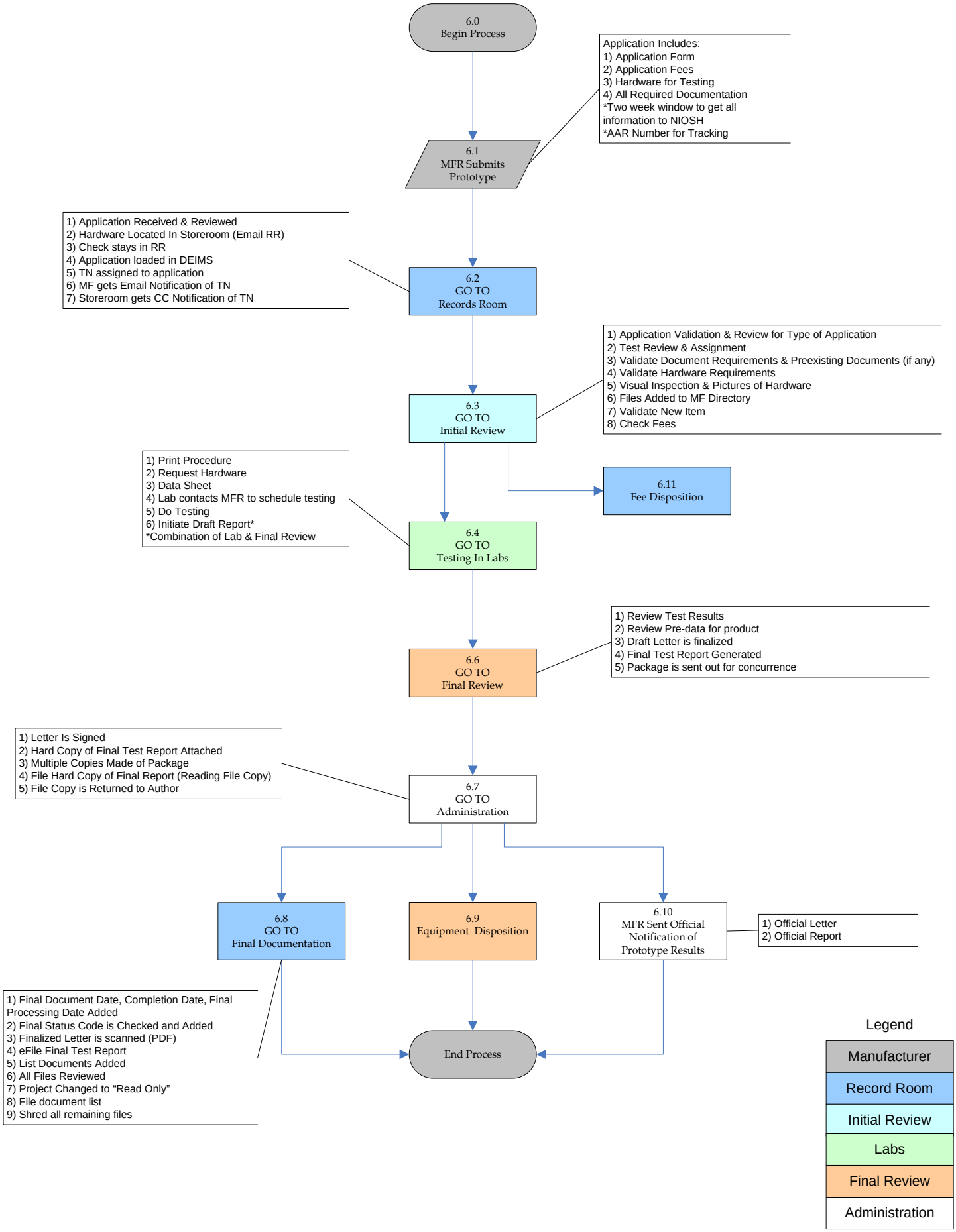
CWF_4.0 Modification Workflow



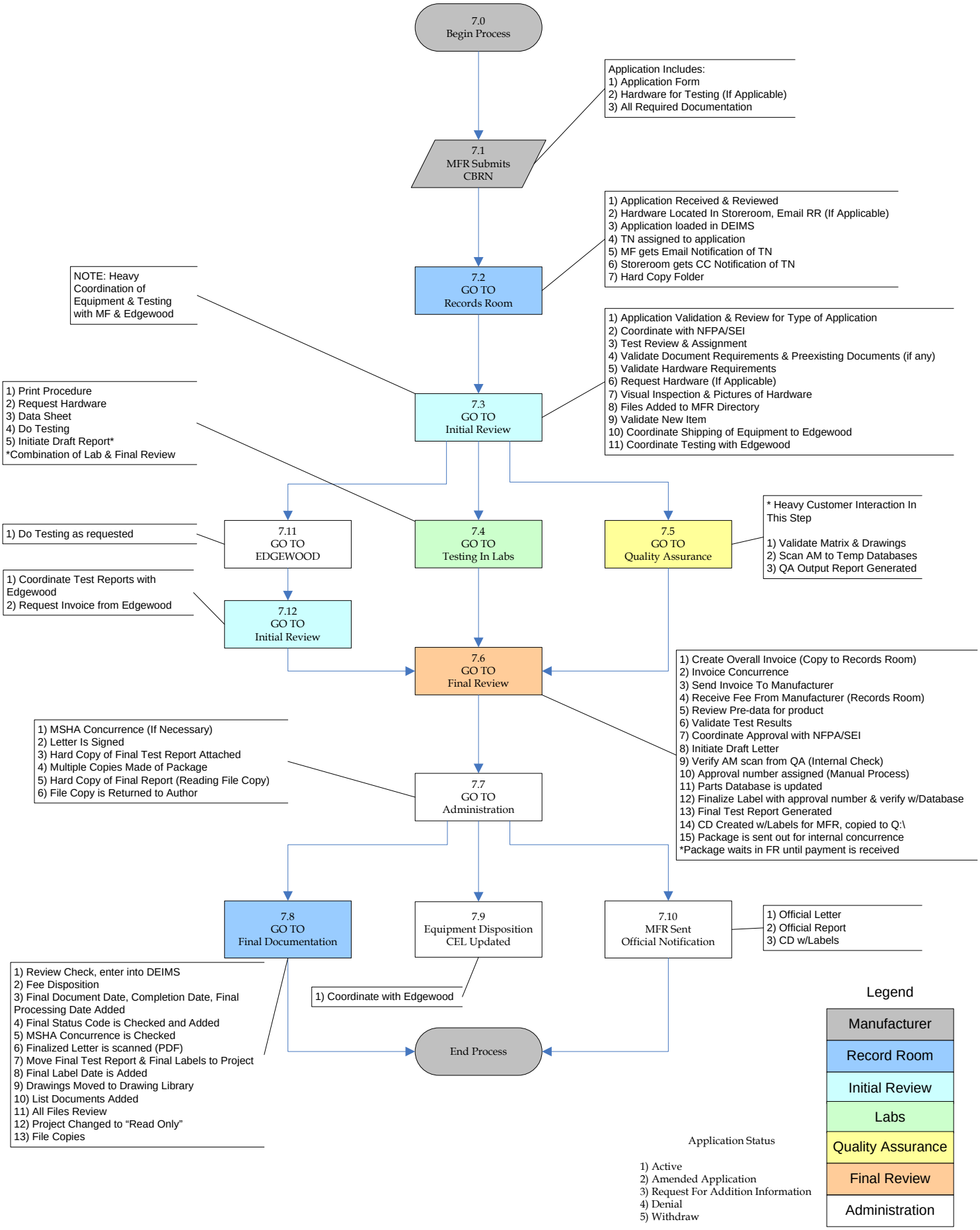
CWF_5.0 Correlation Testing Workflow



CWF_6.0 Prototype Workflow



CWF_7.0 CBRN Workflow (New)



CWF_8.0 CBRN Workflow (Modification)